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The AUTOMOBILE

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No. 24

NEW YORK, DECEMBER 14, 1916

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Three dollars a year



FASTER! Open the throttle—advance the spark—tramp on her tail—one minute to make it. Easy enough with a Continental, when you want to get there, and get there quick.

Yet the flash of swiftness, or the mad onrush that crashes through the smoke welter of the speedway, is really not the speed that counts; for it is a fever, not an excess of vitality. Continental speed is that healthy speed which endures; which, day in and day out during long years of service, can be depended upon for every emergency. More speed than you will ever need—that is the measure of Continental ability.

For speed is the daughter of power. And power is characteristic of the Continental Motor—power abundant yet within bounds, bringing no risk, never creeping to the danger mark. Continental speed and power are attained by efficient design carried out under exacting standards of workmanship.

These surpassing qualities have been made possible by the sterling work of the foremost technical experts of both America and foreign lands, men of the Continental and allied firms. Their work has made the Continental America's standard motor.

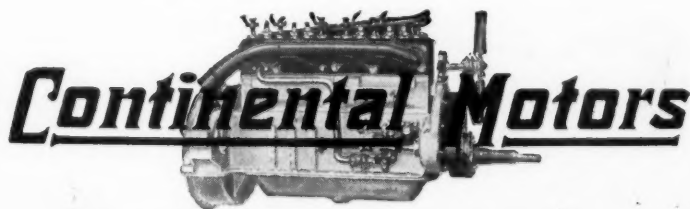
*Booths 50 and 51, Chicago Automobile Show,
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CONTINENTAL MOTORS COMPANY

Offices:
Detroit, Mich.

Factories:
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Largest exclusive motor manufacturers in the world.



Stewart Products



Stewart Speedometer
\$25



\$1

No Profitless Days with Stewart Products

Dealers sell Stewart Products every day, every week, every month in the year.

Each season is a Stewart Products season. That is one reason why Stewart Products are such a fast-selling and profitable line for dealers.

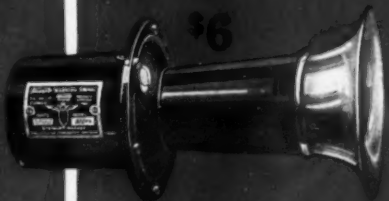
Stewart Products have a big sale in Winter, Spring, Summer and Fall—they are needed and used all the year 'round.

There is the Stewart Tire Pump, needed in the Summer, but an absolute necessity in Winter. When ice and snow cover the ground—when it is bitterly cold—there is no task so unpleasant as to get out and hand-pump a tire. A Stewart Tire Pump will do the work quickly while the motorist sits in the car, out of the cold. It's easy to imagine the comfort and convenience a Stewart Tire Pump gives.

The same is true of all Stewart Products—each one is a Winter necessity.

"It will pay you to see that every car is equipped Stewart."

STEWART-WARNER SPEEDOMETER CORPORATION
CHICAGO, U. S. A.



Stewart Motor Driven Warning Signal
\$6



Warner Auto-Meter
\$50



Stewart Vacuum System
\$10



Stewart Tire Pump
\$12.99



Stewart Speedometer for Trucks
\$10



Stewart Hand Operated Warning Signal
\$3.50

The AUTOMOBILE

VOL. XXXV

NEW YORK—THURSDAY, DECEMBER 14, 1916—CHICAGO

No. 24

Ajax to Purchase Racine Co.

—
Will Ratify Deal on Dec. 26—
Ajax Increases Capital
to \$10,000,000

NEW YORK, Dec. 12—The Ajax Rubber Co., Inc., of this city and with a factory in Trenton, N. J., has arranged for the purchase of the Racine Rubber Co., Racine, Wis., and has called a meeting of its stockholders for Tuesday, Dec. 26, at which the purchase of the Racine Co. will be ratified. It is understood that this purchase will not change the present status of the Racine Co., which manufactures Racine and Horseshoe brand tires. The purchase of the Racine company is in exchange for shares of the capital stock of the Ajax organization.

New Capitalization

As a part of this purchase the Ajax company has increased its capital stock from \$5,000,000 to \$10,000,000. Up to the present there has been 100,000 shares of capital stock with a par value of \$50, but under the new arrangement there will be 200,000 shares at the same par value. The entire stock is common and there are no bonds. As a result of the deal and the rumors of it Ajax stock rose on the New York Stock Exchange from \$70 to \$90 in the past 10 days. The company has been paying 10 per cent dividends.

Rapid Development

During the past year Ajax has developed very rapidly, increasing its daily output from 2000 casings to 5000. There has been a similar increase in the manufacture of tubes. During the year a new factory building, 550 by 350 ft. and three stories in height, has been occupied. In addition other warehouses have been built. During the year the number of

dealers handling Ajax tires has been increased from 4000 to 6000. In addition seven new branch houses have been opened, bringing the total to 23.

The Racine Rubber Co. has sold its output to approximately fifty to sixty jobbing accounts in contrast with the Ajax distribution through 6000 dealers. In this respect the lines complement each other and the present policy of distributing the Racine product through jobbers will be continued. The volume of business of the two concerns is approximately the same.

Cadillac Prices \$160 Higher

DETROIT, Dec. 11—The Cadillac Motor Car Co. will raise prices on all models \$160, effective midnight Dec. 14. All cars shipped after that time will be charged at the new prices with the following exceptions subject to prior sale. It will furnish at present prices cars of each body style to customers' signed unfilled contracts in the possession of the dealers on Dec. 14.

Increase Mack Truck Prices

NEW YORK, Dec. 8—The International Motor Co., this city, will advance its list prices on the Mack truck Jan. 1, as follows: 1-ton, \$2,000 to \$2,150; 1½-ton, \$2,350 to \$2,500; 2-ton, \$2,700 to \$2,800; 3½-ton, \$3,400 to \$3,650; 5½-ton, \$4,000 to \$4,250, and 7½-ton, \$4,500 to \$4,600.

Austin Increases Prices

GRAND RAPIDS, MICH., Dec. 11—The Austin Automobile Co., has increased the prices on its different 1917 models as follows: The two and four-passenger roadster from \$3,150 to \$3,750; the five- and six-passenger touring car from \$3,400 to \$3,750, and the seven-passenger touring car from \$3,400 to \$3,750; the coupé from \$3,950 to \$4,550; the sedan from \$4,350 to \$4,950, and the limousine from \$4,650 to \$5,250.

Analyzes After-War Conditions

—
Report of Federal Trade Commission Manifests Confidence for Future

WASHINGTON, Dec. 12—What will trade conditions be after the war is one subject handled in the long-looked-for recommendations from the Federal Trade Commission which deal with problems that will confront the United States, especially exporters, when hostility ceases. This report is a comprehensive review covering years of foreign trade conditions.

With regard to meeting European trade, the three important considerations involved are:

First—The presence of concerted action among the foreign competitors of American exporters.

Second—The probable effect of similar action by American manufacturers in foreign trade, including its possible disadvantages to domestic consumers and smaller competitors.

Third—The effect of the present laws of this country upon such co-operation on the part of American manufacturers.

Co-operation Advantageous

"The commission believes," says the report, "that the advantages to be gained by effective co-operation in foreign markets need not entail any sacrifice of the firmly established policy of this country in regard to the maintenance of fair competitive conditions and the prohibition of monopolistic control within the United States. At the same time, co-operation for export trade will enable the exporting manufacturer to realize an increased return for his products along with decreased costs through larger scale production, and the country

(Continued on page 1000)

Newby Resigns from National

Had Directed Company's Affairs for 16 Years—Dickson Succeeds Him

INDIANAPOLIS, Dec. 10—Arthur C. Newby, founder and for 16 years president of the National Motor Car and Vehicle Corp., has relinquished the presidency of the company to his chief assistant and general manager, G. M. Dickson. Mr. Newby has not been in the best of health lately and his retirement has been expected. He continues, however, to be the largest individual National stockholder.

A pioneer in the automobile field, having been with the National Electric Car Co., back in 1888, and 2 years later forming the National Gasoline Engine company, he has naturally been an enthusiast in the industry's activities. He was a leader in the early days of racing, being a staunch advocate of stock car racing. His cars were usually among the leaders, if not winning.

Recent connection made with the substantial new interests in the affairs of the National company, were the means of greatly increasing the size and production of the factory. With the company on the enlarged basis Mr. Newby proposed that Mr. Dickson be made president.

Mr. Dickson is not a newcomer to the automobile field, being associated with Mr. Newby at the National plant for 15 years.

With the change of titles the new officers are the same individuals who have assisted in the management of the factory for the past 10 years. They are: G. M. Dickson, president and general manager; W. Guy Wall, vice-president and chief engineer; and M. E. Elstum, secretary and treasurer.

Precision Die Casting Merges Two Companies

SYRACUSE, N. Y., Dec. 9—The entire business of the Van Wagner Die Casting Corp., formerly the E. B. Van Wagner Mfg. Co., and the Precision Die Casting Co. has been purchased from Charles Van Wagner and the two companies will be merged into the Precision Die Casting Co., with a capital of \$315,000.

Alterations and extensions to the factories have already been undertaken and more capital provided to take care of increased business.

The officers and directors of the new company include: President, T. G. Meachem, vice-president and general manager of the New Process Gear Corp.; vice-president, J. W. Knapp, treasurer of the Van Wagner Die Casting Corp.;

treasurer, H. S. Tenney, secretary of the Syracuse Trust Co., and secretary, E. J. Quintal, of the accounting firm of Farrell, Sehl & Quintal. The above officers and the following include the directors: A. P. Bellinger, of the Solvay Process Co.; G. W. Bowen, of the G. W. Bowen Mfg. Co., Auburn, N. Y., and W. A. Ball, of the Semet Solvay Co.

Gauvreau Joins Buick

DETROIT, Dec. 9—Victor Gauvreau has resigned as chief engineer of the Frontenac Motor Co. to join the Buick Motor Co., Flint, Mich.

Weed Chain Maker Plans Capital Increase of \$6,000,000

NEW YORK, Dec. 13—Stockholders of the American Chain Co., maker of the Weed chains, have been notified that a meeting will be held on Dec. 22 for the purpose of voting on an increase of capital from \$4,000,000 to \$10,000,000 by increasing the preferred from 20,000 shares, par \$100, to 50,000 shares, par \$100, and by increasing the common from 20,000 shares, par \$100, to 50,000 shares, par \$100. Each share of additional preferred will be entitled to the same preference and priority over the common as the preferred now issued and outstanding.

American Chain Takes Standard

YORK, Pa., Dec. 12.—The Standard Chain Co., operating nine large plants throughout the country, passed into the hands of the American Chain Co., with the sale of its interests to the latter and the resignation of J. C. Schmidt, York, Pa., the president of the Standard Chain Co. for the past 17 years, this week. The products of the Standard company include at least 1500 varieties, sizes, styles and types of chain, with automobile chain and automobile forgings.

Besides the two plants in York the company had been operating chain plants at Braddock, Allegheny county; rolling mill and Hayden chain plant at Columbus, O.; and one plant in each of the following cities: Carlisle, Pa., Mansfield and St. Mary's, Ohio, and Marion, Ind. The company employs approximately 1700 hands, of these 1000 being employed in the two York plants.

Arthur C. Newby, founder and president of the National company for the last 16 years



Bans Newspaper Publicity

P. O. Points Out It Violates Rule Against Advertising as News Matter

WASHINGTON, D. C., Dec. 12—Automobile publicity which has been carried in daily papers has come under the finger of the third assistant postmaster general, who has notified several daily papers that this publicity is in violation of the act of Aug. 24, 1912, which forbids the running of statements which are properly advertising matter and not news. Large daily papers in many cities have received letters from the third assistant postmaster general drawing attention specifically to items published which are properly advertising information. The department expects to report later on the result of its investigations. The article in question appearing in the daily papers cover a variety of subjects, some refer to the opening of new agencies, others to the photographs of new cars, others to comments on winning contests and others on various subjects. The presumption is that many daily papers have been accepting reading notices from concerns placing advertising, it being stated that the reading notice is a verbal part of the advertising agreement. This situation has come to the attention of the third assistant postmaster general with the results as stated.

There are various suggestions as to how the matter reached official circles in Washington. It has been stated that paper manufacturers displeased with the complaints of publishers have intimated that if the daily press cut out the free readers there would be room for plenty of news that is at present kept out. Those large daily papers which have strongly and consistently opposed this method of publicity are naturally gratified at the present investigation.

In a Friendly Spirit

Third Assistant Postmaster General, W. M. Dockery, discussing with a representative of THE AUTOMOBILE the movement, said he was taking this step in the friendliest possible spirit as toward the newspapers of the country, and he felt and believed it would be only necessary for him to call the attention of publishers to the law which forbids such a practice, to bring about a cessation of this form of activity.

"While it is hard to draw the line of demarcation between a newspaper article discussing certain facts in connection with the performance of a suggested make of an automobile, which article might not constitute an advertisement, (Continued on page 1001)

To Facilitate Argentine Shipments

Mercantile Corp. Formed for Co-operative Trade in Non-Competing Lines

NEW YORK, Dec. 13—The Argentine Mercantile Corp., an organization for the purpose of co-operative trade in non-competing lines, has been started in this city for the purpose of making trade with Argentina easier to handle. Fifty to sixty different U. S. A. manufacturers in varied lines, none connected with the automobile industry, are reported to have met last week for preliminary organization work and will meet later this week to complete organization plans and elect officers.

The plan of this corporation consists in maintaining in the city of Buenos Aires a permanent exhibition of samples of all goods manufactured by those who are members of the corporation. This exhibit of samples will be in charge of salesmen and in addition there will be a force of salesmen traveling through the Argentine Republic in the interest of those belonging to the corporation.

To facilitate shipping of goods, exchange, collections, etc., the Argentine Mercantile Corp. contemplates maintaining a shipping department at the Bush Terminal, New York City, where 3700 sq. ft. of shipping space will be maintained and a clerical shipping force engaged. It will only be necessary for members to consign their merchandise to this office, after which all matters of crating, engaging accommodation, marine insurance, etc., will be handled by the corporation.

In the matter of payments, it is expected that members will be paid for their merchandise when delivered at the Bush Terminal and that the corporation will handle the entire work of collections in South America, banking accommodations, exchange, etc.

According to the present plans, which are very incomplete, each member of the corporation will place samples in the Buenos Aires exhibit, and that the rent for such exhibit building, overhead, and other charges will be paid for by the members according to the exhibit space they occupy. It is planned to place one salesman over each particular line of merchandise, such as agricultural machinery, or automobile accessories, or hardware lines, etc. Only one make of automobile or one make of motor truck would be handled.

The organization of the Argentine Mercantile Corp. has not progressed sufficiently to state what membership initiation fees, and annual dues will be charged. The corporation has been or-

ganized for the purpose of profit and dividends will be declared in some manner to those participating. It is expected that manufacturers will sell goods to the corporation at their export prices. It is planned to place the organization in the control of thirty-one directors, fifteen of whom have already been named.

The organization is being fostered by one William Hill Hunt. Mr. Hunt says he has spent some time during the past year in Argentina collecting information on those lines of goods which have sold best in the republic.

Joy Leaves Packard — Dividend Increase

DETROIT, Dec. 14—H. B. Joy has resigned as chairman of the board of directors of the Packard Motor Car Co. because of other interests. At its meeting here yesterday the board of directors increased the dividend on the stock from 7 to 8 per cent yearly payable as 2 per cent quarterly. The next payment is January.

Pfeffer and Brinegar Go to Cuba

DETROIT, Dec. 12—C. A. Pfeffer, who recently resigned as vice-president and assistant general manager of the Chalmers Motor Corp., and E. P. Brinegar, the man credited largely for the organization of the old E. R. Thomas Detroit Co., sailed from New York City last Saturday for a pleasure trip through Cuba.

Holmes Building Own Car

SYRACUSE, N. Y., Dec. 12—Arthur Holmes, formerly sales manager of the H. H. Franklin Mfg. Co., this city, has started a company of his own in this city for the purpose of manufacturing automobiles.

Chalmers to Retire from D. A. C. Presidency

DETROIT, Dec. 8—Hugh Chalmers has announced that he will retire permanently from the presidency of the Detroit Athletic Club, of which he has been the head for the past four terms. Coupled with his announcement Mr. Chalmers has presented the club with Herman Richir's painting "The Red Shawl," which he acquired following its exhibition in the Belgian section of the Panama-Pacific Exposition.

Mr. Chalmers has been the only president the club has had since moving to its downtown location.

Ball & Ball Carbureter on Winton

CLEVELAND, OHIO, Dec. 6—The Winton Co. has adopted the Ball & Ball carbureter, made by the Penberthy Injector Co., as standard equipment.

To Raise Tire Prices 15 to 20%

Increase in Price of Materials and Cost of Manufacture Responsible

NEW YORK, Dec. 9—Leading tire manufacturers are planning to make a substantial advance in automobile tire prices next year. This increase, it is expected, will be between 15 and 20 per cent. Early this year prices were advanced an average of 12½ per cent.

The high cost of the materials used in the manufacture of tires has necessitated this increase. Fabric is now selling at an advance of about 125 per cent over the figure of a year ago. Although crude rubber is not now commanding exorbitant prices, other materials used in tire making are advancing skyward and there is a greater amount of fabric than of rubber in an automobile tire. On an average, the cost of the materials used in tires has risen at least 20 per cent.

Lansdale Leaves Denby Truck

DETROIT, Dec. 11—Henry Lansdale has resigned the vice-presidency of the Denby Motor Truck Co. Mr. Lansdale has been the vice-president and general manager for the company since 1915.

Girl Heads Standard Parts

CLEVELAND, Dec. 8—Christian Girl is president of the Standard Motor Parts Co., the combination of the Standard Welding Co. and the Perfection Spring Co. The Perfection plant will now be known as the spring department and the Stanweld plant as the rim and tube department.

Other officers of the new concern are: F. W. Prentiss, first vice-president; E. W. Farr, second vice-president; T. E. Borton, treasurer. C. C. Bolton and Arnold S. Goss, together with the officers above, will constitute the board of directors. P. A. Connolly is secretary, but not a director.

Jackson Goes to Europe

DETROIT, Dec. 11—R. B. Jackson, factory manager for the Olds Motor Works, has gone to Europe to study automobile construction. He will visit London, Paris, Germany and Italy, and will attend the automobile show at Paris besides visiting all factories.

Bethlehem Truck Ready in February

NEW YORK, Dec. 12—Two truck models of 1½ and 2 tons' capacity will be marketed about February by the Bethlehem Motors Corp., Allentown, Pa. A new

plant to have a floorspace of 199,000 sq. ft. is being built. The concern has a capital of \$6,000,000, made up of \$1,000,000 preferred, paid in, and \$5,000,000 common. The preferred is all held by the four men who head the concern.

Arthur T. Murray, formerly of the Brady-Murray Motors Corp., local Chandler dealer, heads the concern as president. Associated, besides Allentown and Bethlehem capitalists, with Mr. Murray is W. S. Stevenson, formerly sales manager of the old Mack Bros. Motor Truck Co., who will be sales manager. D. G. Dery, a silk manufacturer, is vice-president.

Carburetion Subject of Ind. S. A. E. Meeting

INDIANAPOLIS, IND., Dec. 9—The December meeting of the Indiana Section of the Society of Automobile Engineers will be held Dec. 15 in the Assembly Hall of the Claypool Hotel.

The subject of the meeting will be "Carburetion and Manifolding," papers being read by F. C. Mock, chief engineer of the Stromberg Motor Devices Co., and by Professor Berry, professor of experimental engineering, Purdue University.

582 S. A. E. Banquet Tickets Sold

NEW YORK, Dec. 7—Tickets for the annual banquet of the Society of Automobile Engineers on Jan. 11 at the Hotel Biltmore are being sold fast. To date 582 have been sold out of a total of 750. Every seat, numbering 762, has been taken for the special performance of Ziegfeld's Midnight Follies, which comes as a climax to the dinner.

S. A. E. to Meet in Detroit

DETROIT, Dec. 11—The Engine and Transmission Division of the Society of Automobile Engineers, and of the Council of the S. A. E. will meet in Detroit on Dec. 14.

Stetson Motor Car Co. Formed

DOVER, DEL., Dec. 7—The Stetson Motor Car Co., with a capital of \$1,000,000, has been incorporated to manufacture automobiles and appliances. The incorporators are P. A. Zizelman, W. Hanford and C. W. Van Ranst, all of New York.

Troy Trailer Sales Co. Formed

TROY, OHIO, Dec. 11—The Troy Trailer Sales Co. has been incorporated under the laws of Ohio by C. A. Geiger, C. N. Peters, G. R. Harris, R. C. Sykes and H. H. Tamplin. The Troy Wagon Works Co. will henceforth market its trailers under the name of the Troy Trailer Sales Co.

New Engine-Testing Method

Prof. Roesch, of Armour Institute, Describes His System Before Mid-West S. A. E.

CHICAGO, Dec. 9—A method of testing automobile engines and of charting the results of these tests in such a manner that a great deal more information becomes available than has been possible in present methods of testing has been developed by Prof. Daniel Roesch, associate professor of gas engineering Armour Institute of Technology. It is Prof. Roesch's contention that the present method shows the performance only under wide-open throttle conditions, a condition not often maintained in use, and that one engine showing superior merits to another under the usual test conditions might not be so good when tested under properly open-throttle conditions, at which most automobile engines are usually operated. His method involves, of course, tests made in the conventional way at various speeds with wide-open throttle and corresponding one at other throttle positions, thus giving power, gasoline consumption, heat losses, effect of spark advance, etc., under all conditions as driving. Prof. Roesch explained his method of conducting tests and outlined the results obtained and what was to be deduced from them in his paper presented at the quarterly meeting of the Mid-West section last night. This meeting was held at the Armour Institute of Technology, Chicago, and after the presentation of the paper and its discussion the speaker conducted the seventy-five engineers and motorists present to the testing laboratory of the institution and actually ran a partial test, according to his new method, on a twelve-cylinder Packard engine.

In the discussion G. A. Smith, of the Nash Motors Co., brought out the fact that the results of Roesch's tests showed the great advantage from economy standpoint of operating the engine at a certain definite speed and that it was one of the reasons for the better economy of European engines that more gear changing was done.

In reply to his question whether all the curves shown were the result of tests and whether all were made on the same carburetor setting, Mr. Roesch explained that the carburetor setting must be maintained constant.

Engineer Mock, of the Stromberg company, suggested that Roesch's method of testing could be used to co-ordinate curves of engine and car performance by using the deceleration test for car performance, and that he had witnessed car tests on the road which showed the practical value of Roesch's charts. He

pointed out that chart No. 7 showed the economy of gearing the car low. He said he had witnessed an increase in economy of from 18 miles per gallon to 30 m.p.g. by gearing the car as a truck is geared and shifting as necessary. He felt the spark advance should be susceptible to control according to the throttle opening.

Buffalo Section S. A. E. Formed

BUFFALO, Dec. 13—*Special to THE AUTOMOBILE*—The Buffalo section of the Society of Automobile Engineers was enthusiastically formed here to-night at the Buffalo Engineering Society meeting, 150 being in attendance. The governing committee of the new section is: Chairman, David Fergusson, chief engineer pleasure car department Pierce-Arrow Motor Car Corp.; vice-chairman, C. M. Manly, vice-president and chief engineer Manly Drive Co.; secretary, D. W. Sowers, president and engineer Sowers Mfg. Co.; treasurer, John Younger, chief engineer motor truck department Pierce-Arrow Motor Car Corp. and chairman of membership committee, H. T. Parrock, manager Lumen Bearing Co.

Russell Huff, president of the S. A. E., Coker Clarkson, secretary and general manager, and A. Ludlow Clayden, chairman of the standards committee, spoke on the general advantages of the society, President Huff stating that within 4 weeks the society will have a membership of 2600, the Detroit section now having over 650.

The paper by A. P. Brush on the four-cylinder engine, appearing on pages 1006 and 1007 of this issue, provoked considerable discussion, seeming to fall in with the views of those present.

Re-organization of Ross

DETROIT, Dec. 12—It is reported that C. G. McCutcheon will resign his presidency of the Ross Automobile Co. to take effect Jan. 1, and that a number of New York capitalists will re-finance the concern to the extent of \$500,000.

Muir Heads Maxwell Advertising

DETROIT, Dec. 12—Gordon Muir has been appointed advertising manager of the Maxwell Motor Co., Inc. Mr. Muir has been with the Maxwell company for the past year.

Weed Hal Advertising Manager

DETROIT, Dec. 11—J. C. Weed has been appointed advertising manager of the Hal Motor Car Co. of Cleveland.

Lloyd Is Cassidy Advertising Manager

NEW YORK, Dec. 11—L. M. Lloyd has become advertising manager for the Edward A. Cassidy Co., this city. The Cassidy company handles the national sales of many automobile accessories.

Makers Arrange Banquet Program

White Toastmaster—Speakers Include Leland, Coffin and Clarkson

DETROIT, Dec. 12—A reception committee has arranged a program for the Manufacturers' Banquet to be given by the Society of Automobile Engineers on Dec. 14. The committee is composed of D. McCall White, chairman, and chief engineer of the Cadillac Motor Car Co.; B. G. Koether, general sales manager of the Hyatt Roller Bearing Co.; Russell Huff, chief engineer for Dodge Bros.; W. C. Rands, president of the Motor Products Corp.; K. W. Zimmerschied, chief metallurgist for the General Motors Co.; R. F. Dyer of the Aluminum Castings Co.; J. E. Diamond, engineer for the Aluminum Castings Co.; A. H. Doolittle, sales and advertising manager of the Zenith Carburetor Co.; W. B. Stout, manager the aircraft department of the Packard Motor Car Co.; A. I. Stevens of the N. Z. Graves Corp.; C. L. Nedoma of the Chalmers Motor Co.; L. V. Spencer of E. E. McCrone & Co.; L. B. Fijux, branch manager of the Bijur Motor Lighting Co.; H. A. Brown, sales engineer of the Hyatt Roller Bearing Co.; R. T. Middletown, branch manager for the Steel Products Co.; W. C. Keys, assistant engineer of the Cadillac Motor Car Co.; C. T. Myers, consulting engineer, and O. E. Hunt, chief engineer the carriage division of the Packard Motor Car Co.

The program will be started by a speech from Russell Huff, president of the Society, who will introduce D. McCall White, who will be toastmaster for the occasion. Other speakers will include Coker F. Clarkson, general manager of the S. A. E.; Job Hedges of New York; Captain L. E. Goodier, Jr., of the aviation service; H. M. Leland, president of the Cadillac Motor Car Co., and Howard Coffin, director of the Hudson Motor Co., besides a number of others who are expected to signify their assent shortly.

Lozier Brothers Co. Announces New Cars and Officers

PHILADELPHIA, Dec. 11—The Lozier Brothers Co., recently formed with a \$1,000,000 capital to build a four at \$785 and a six at \$1,595, announces its officers and directors as follows: H. A. Lozier, president; G. P. Grandfield, vice-president, former first assistant United States postmaster general; H. S. Evans, treasurer, manager of the International Time Recording Co., Philadelphia; P. E. Remington of New York; H. C. Shober, vice-president of the National Bank of Hu-

ron, S. D.; F. M. Byrne, Governor of South Dakota; Roswell Davis, president of the First National Bank, Freeport, L. I., N. Y.; Hugh Herndon, New York lawyer; Kern Dodge, consulting engineer, Philadelphia, and a director in the Link-Belt Co., Chicago, and James Levy, Chicago. The four-cylinder car will be featured with a 3½ by 5½ valve-in-head engine, Stromberg carburetor, Remy distributor, thermo-syphon cooling, semi-elliptic springs, 32 by 3½-in. tires, and a 112-in. wheelbase. The six-cylinder model will have a 3½ by 5½ valve-in-head engine, Bosch magneto, 34 by 4½-in. tires, and a 127-in. wheelbase.

General Engineering Directorate Completed

DETROIT, Dec. 8—At a meeting of the stockholders of the General Engineering Co., this week, the organization of the directorate was completed. The members of the board include Abner Doble, J. H. French, M. J. Hammers, C. L. Lewis, A. W. Russel and W. F. Trant. Officers elected were C. L. Lewis, president; Abner Doble, vice-president, and M. J. Hammers, secretary and treasurer.

Bucyrus Rubber Elects Directors

BUCYRUS, OHIO, Dec. 7—The following directors were elected at the annual meeting of the Bucyrus Rubber Co., this city: W. A. Blicke, Jacob Coulter, P. H. Heater, Philip Browarsky, A. J. Richards, W. J. Schwenck, A. G. Stoltz, H. A. Paxton and George Donnenwirth.

The company is at present employing forty-five men with a daily output of eighty tires.

\$10,000,000 Parts Co. Plans Industrial Town in Los Angeles

LOS ANGELES, Dec. 13—A \$10,000,000 parts concern, under the name of the Eisenhuth Motor Co., has been formed and has obtained an option on a 364-acre site at Los Angeles harbor. It proposes erecting a parts and assembly plant, a foundry and factory buildings to construct parts for all makes of automobiles and trucks. It will build everything that enters into automobiles except tires.

J. W. Eisenhuth, president of the company, is a capitalist, formerly of New York and Brooklyn. He states that the project is being financed by eastern capital. Eisenhuth's idea is to surround the factories with an industrial town where living conditions are ideal. He says construction will start next month.

Monroe Buys Four-Story Factory

PONTIAC, MICH., Dec. 13—The Monroe Motor Co. has purchased the four-story factory formerly owned by the Auto Painting & Trimming Co. This acquisition increases the Monroe company's available floorspace by 100,000 sq. ft.

113,000 Overlands on Contract

Valued at \$100,000,000—More Than 4600 Dealers Attend Convention

TOLEDO, Dec. 13—During Monday and Tuesday of this week 29,500 cars valued at \$25,000,000 were signed for by Willys-Overland dealers in convention at the factory. This makes a total of 113,000 cars worth \$100,000,000 taken by dealers since the opening of the convention, Dec. 4. Over 4600 delegates have arrived at the factory.

The convention will continue until Dec. 23, with fresh groups arriving every other day, and John N. Willys, president of the company, believes that the 3 weeks during which the dealers will be in Toledo will mark the sale of 200,000 cars, with a value of \$200,000,000, which means that the company's entire output for 1917 will have been contracted for.

The company is doing everything in its power to make the convention a success from both an industrial and entertaining viewpoint.

Willys-Overland Increases Wages

TOLEDO, Dec. 9—Wages of the employees of the Willys-Overland Co., will be increased to total \$1,250,000 per year. The wages of companies allied with the Overland company have been increased \$225,000 per year at the Electric Auto-Lite Co., \$350,000 per year at the Morrow Mfg. Co., of Elmira and \$100,000 per year at the Morrow Mfg. Co. at Elyria, Ohio. The rates of increase are:

All rates up to and including 30 cents per hr. will be increased 10 per cent.

All rates over 30 cents and including 40 cents per hr. will be increased 7½ per cent.

All rates over 40 cents per hr. will be increased 5 per cent.

All piece work rates will be increased 5 per cent.

A. O. Smith Raises Wages 10%

MILWAUKEE, Dec. 13—The A. O. Smith Co., this city, has announced a 10 per cent increase in wages for all employees drawing less than \$125 per month, effective Dec. 1. This affects approximately 1400 men.

Heinze Concentrates on Ford Starters

SPRINGFIELD, OHIO, Dec. 12—The John O. Heinze Co., manufacturer of starting and lighting apparatus, is at present confining its entire efforts to the manufacture of Ford starters. The factory has a daily capacity of 100 outfits and

has 280 employees. The company is manufacturing all of the electrical apparatus entering into these, such as manufacturing its own armatures, doing its own winding, and manufacturing its fixtures and regulators. The company incorporated in July a year ago and started production in March of the present year. It was not until last October that the present rate of production was reached.

Smith Truck Elects Directors

NEW YORK, Dec. 7—The Smith Motor Truck Corp. at its directors' meeting elected the following board of directors: A. D. Smith, E. I. Rosenfeld, A. G. Hanauer, J. M. Hoyt, C. B. Little and Louis Hennock.

Clodio to Concentrate on Houdaille Shock Absorber

NEW YORK, Dec. 12—Paul V. Clodio, until recently senior partner of the firm of Clodio & Engs, metropolitan distributor for Kissel, has resigned from that firm to form the Houdaille Shock Absorber Co., Inc., at 1737 Broadway, New York. Associated with Mr. Clodio as incorporators are John N. Van Vranken and Edwin Rushmore.

The plan is to exploit more widely the Houdaille patents and Mr. Clodio has found it desirable to confine his efforts more closely to the shock absorber, the American rights to the manufacture of which he has controlled for years.

The Houdaille shock absorber is standard equipment on the Mercer cars for 1916 and 1917 and on the Peugeot, Panhard, Delaunay-Belleville and other prominent foreign cars.

Star Prepares to Make Tires

AKRON, O., Dec. 11—The Star Rubber Co. is preparing a plant with 100,000 feet of floorspace for extensive manufacturing of tires. The Star company, organized in 1910, has manufactured to a large extent rubber goods for druggists and surgeons, and in 1916 started manufacturing tires in a small way. The company has been recapitalized at \$500,000.

L. H. Firey is president and treasurer. He was for 15 years proprietor of the Coates House in Kansas City. R. R. Robinson, vice-president, is vice-president of the Robinson Clay Products Co., Akron. O. L. Weaver, secretary, was for 10 years with Goodyear, 2 years with Willys-Overland, and the last 4 years northeastern Ohio Pierce-Arrow dealer.

Other prominent stockholders include H. B. Manton, president of the Robinson Clay Products Co.; Francis Sieberling, connected with several Akron rubber companies; I. R. Manton, a director of the Robinson Clay Products Co.; J. P. Loomis, president of the Akron Coal Co., and George D. Bates, vice-president of the First-Second National Bank of Akron.

To Confer on Aeronautics

M. & A. M. and N. A. C. C. Interested—Five New Accessory Members Elected

NEW YORK, Dec. 11—Realizing the important part that aeronautics are destined to play in the future and their close connection with the automobile accessory business, the forthcoming First Pan-American Aeronautic Exposition to be held in Grand Central Palace, New York, Feb. 8 to 15 inclusive, was discussed and acted upon by the executive committee of the M. & A. M. at its monthly meeting in New York, Dec. 8.

Following a talk by Howard E. Coffin, of the Hudson Motor Car Co., and chairman of the Pan-American Aeronautic Exposition, who thoroughly explained the objects of the aeronautical exhibition and aeronautics in general, it was voted to appoint a committee of three to confer with similar committees from the National Automobile Chamber of Commerce, the Aero Club of America, the Pan-American Aeronautic Federation and the American Society of Aeronautic Engineers, at which time the matter of officially approving the aeronautical show will be discussed. Those who will represent the M. & A. M. include President C. W. Stiger, C. E. Thompson, chairman of the show committee, and William M. Sweet, director.

During the past week the M. & A. M. has been elected to membership in the Chamber of Commerce of the United States of America and President C. W. Stiger was elected as national councillor and Vice-President C. E. Thompson as delegate to represent the accessory association in connection with the Chamber of Commerce.

William M. Sweet, chairman of the banquet committee of the M. & A. M., reported in connection with the forthcoming banquet to be held at the Waldorf-Astoria, Jan. 10, that the sale of tickets had greatly exceeded that of any previous year and that it was expected that the 1917 banquet would be the most successful in the history of the M. & A. M.

Five new members were elected, making a total membership of 263 manufacturers of motors, part and accessories.

The new members are: Automatic Car-bureter Co., Chicago; Superior Lamp Mfg. Co., New York; Amalgamated Machinery Corporation, Chicago; Warner & Swasey Co., Cleveland, and the Metal Stamping Co., Long Island City.

Those present at the meeting were C. W. Stiger, president of the Stromberg Motor Devices Co., Chicago; C. E. Thompson, president of the Steel Prod-

ucts Co., Cleveland; E. H. Broadwell, vice-president of the Fisk Rubber Co., Chicopee Falls; Christian Girl, president of the Perfection Spring Co., Cleveland; W. O. Rutherford, general sales manager of the B. F. Goodrich Co., Akron; William M. Sweet, assistant to president of the United Motors Corp., New York; Sidney S. Meyers, counsel of the M. & A. M., and L. M. Bradley, manager.

Kearns Is Lee Tire Manager

CONSHOHOCKEN, PA., Dec. 8—John Kearns has become general manager of the Lee Rubber & Tire Co. He was the organizer of the British Dunlop Co. of Australia. Mr. Kearns comes from the Fisk Rubber Co., Chicopee Falls, Mass., where he was vice-president.

Jackson Is Briscoe Comptroller

JACKSON, MICH., Dec. 13—W. V. C. Jackson has been appointed comptroller of the Briscoe Motor Corp. Mr. Jackson was formerly general manager of the motor wheel division of the A. L. Smith Co.

Kellum with Columbia Motors

DETROIT, Dec. 8—E. F. Kellum has been appointed as purchasing agent for the Columbia Motors Co. Mr. Kellum was formerly associated with the Weston-Mott Co., of Flint. G. J. Martin has been appointed auditor for the Columbia company. Mr. Martin was formerly deputy city comptroller of South Bend, Ind.

Rahan To Make Ford Starters

DETROIT, MICH., Dec. 12—Electric starters will be made for Ford and other cars by the Rahan Co., which is incorporating Jan. 15 under the laws of Michigan for \$100,000.

It is a 12-volt, two-unit system made in straight line form, the generator and motor shafts being co-axial. The patents under which the machine is being made are held by Frank B. Rae, and the principal one is No. 1,153,338 on a transmission mechanism. This is a missing tooth differential operated by a cone which at the apex end terminates in an offset ball connection to the driving shaft and at the base end carries upon its periphery a set of gear teeth, one less in number than the set with which it meshes on the driven side. The device as arranged on the standard unit gives a 30-1 reduction.

The starting motor is series wound and has an over-running ball clutch engagement. It gives 81.6 ft. lb. stalling torque, it is said, with a weight of 42 lb. It is largely made from stampings and die castings. It is regulated by magnetic control. The generator has a charging rate of from 7 to 15 amps., cutting in at 8 m.p.h. The outfit for Fords will sell for \$50.

Tanks for U. S. Army

Will Have Two Revolving Turrets, Armored Machine Guns and Motorcycles

WASHINGTON, Dec. 11—Chief of Ordnance of the Army Crozier, in a report just made, declares that the United States Army soon will be equipped with caterpillar tractors similar to those in use in the British army, the so-called "tanks." The report of General Crozier says armored cars, with two revolving turrets, mounted with machine guns; armored machine guns, equipped motorcycles and individual armor for the men of the ranks, also are under consideration.

Along this line the quartermaster general of the army, in a report, shows that \$2,175,000 was spent by the army on motor truck equipment alone after the expedition was ordered into Mexico in pursuit of Villa.

The quartermaster general, in testifying before the House military committee, said that the use of trucks for transportation purposes has more than tripled the mobility of troops. He added that had General Pershing only mule teams to use in moving his command he could not have traveled half the distance he did in Mexico.

Col. Chauncey Baker of the Quartermaster's Corps testified that a motor truck made from 60 to 120 miles a day against a possible maximum of eighteen for mule teams. A four-mule team, he added, would eat in 4 days all the fodder it could haul. It was shown by Colonel Baker that the army now has 2600 motor trucks of several satisfactory types, and that the machines show less than 20 per cent depreciation in efficiency, despite the severe tests imposed by the hard service they were put to.

Representative Julius Kahn told the committee he was told by Brig-Gen. Franklin J. Bell that it would be possible to put 50,000 men into Chihuahua City in 2 days by motor truck.

Indorse 42-In. Head-lamp Law

NEW YORK, Dec. 8—A conference on the head-lamp situation was held at the S. A. E. office here to-day, among those present being A. Reeves, National Automobile Chamber of Commerce; A. G. Batchelder, A. A. A.; Elmer Thompson, Automobile Club of America; C. A. Stewart, Motor Dealers' Association; A. Ludlow Clayden, chairman S. A. E. standards committee, and Alden McMurtrie, consulting engineer, who has made many experiments with automobile lighting. It was agreed that the limitation

of head-lamp rays to rise not more than 42 in. above the road at a distance of 75 ft. or more in front of the car was a solution of the difficulty which was desirable. It is easy to make lamps which will conform to and to adjust existing lamps to suit a regulation of this sort. What is required is a much more general spreading of the knowledge of how to focus and set head-lamps. It was remarked that of all instruction books issued by automobile manufacturers, very few indeed gave any instructions for focusing a lamp, although this is almost as important as adjusting a brake. Thus it seems that the chief work of the different bodies representing automobilism will be to educate users of cars, dealers, repairmen and manufacturers into the art of lamp adjustment. The work now being done by the S. A. E. committee in an experimental way will benefit the manufacturer most of all by indicating how to make lamps in the future that will require a minimum of adjustment.

Win Temporary Injunction Against Ford

DETROIT, Dec. 9—A temporary injunction, restraining Henry Ford and the Ford Motor Co. from the erection of a \$12,000,000 blast furnace plant was granted in behalf of John F. and Horace E. Dodge by the Wayne county circuit court in the decision rendered to-day in their suit against Henry Ford. The extensions to the Ford plant, now in process, are not affected by the decision. The judges recommended that the suit come to a hearing on its merits within 60 days.

The suit will come before the court again Dec. 13, when counsel for both sides will appear before Judge Wiest to arrange for carrying out the conclusions of the judges.

Two Ghent Models for 1917

CHICAGO, Dec. 13—The Ghent Motor Co., Ottawa, Ill., will bring out a four at \$750 and an eight at \$1,050 in 1917. Both models are touring cars. The four will use an L-head 3¼ by 4¼-in. motor, developing 37 b.hp. Oiling is accomplished by force feed and splash system. It also uses the model R Schebler carburetor with hot air stove and the electrical system is the three-unit Gray & Davis. A 6-volt starting and lighting and manual control ignition system with a 90-amp. hr. storage battery and a motor-driven horn are used. Rear axle is floating and the drive is Hotchkiss. Springs are semi-elliptic, both front and rear. The wheels are Parker hydraulic pressed steel. The body has the center cowl with straight stream line from radiator back. The windshield is set at an angle of 25 deg.

With the exception of the rear axle, which is three-quarter floating, the specifications of the eight are practically the same as the four.

Military Tractor Train Tested

U. S. Government Makes Exhaustive Test in Texas of Caterpillar Type

MARFA, TEX., Dec. 7—The initial test run of the military tractor train recently received here from Peoria, Ill., for use in the Big Bend region of the upper Rio Grande border, has just been finished. The run was made over a rough stretch of country, and is said to have come up to the army requirements in every way. The test was conducted under the direction of Capt. H. A. Hegeman, quartermaster in charge of the motor truck shops at Fort Sam Houston.

The run was made between Marfa and Presidio, a distance of 63 miles, over a desert, rough region where water is scarce. The equipment consisted of a 75-hp. caterpillar tractor and four trailers, each equipped with caterpillar tread instead of wheels. Each trailer had a cargo-carrying capacity of 15 tons.

The trip was made at an average speed of about 2½ m.p.h. over a road that is a road in name only. The train was loaded to full capacity with supplies on its outgoing trip. Captain Hegeman will make a complete report on the trial trip to Col. H. L. Rogers, chief quartermaster of the Southern Department, with headquarters at Fort Sam Houston.

Anderson Motor Co. Incorporates

ROCK HILL, S. C., Dec. 8—The Anderson Motor Co., this city, maker of the Anderson car, has incorporated with a capital of \$1,500,000. The incorporators are J. B. Johnson, J. G. Anderson, T. L. Johnston, J. M. Cherry, Alex Long and J. W. O'Neal, all of this city, and J. A. Carr of Birmingham.

United Takes Over Fairbanks Hammers

BOSTON, Dec. 9—The United Hammer Co., this city, has purchased the power hammer business of the E. & T. Fairbanks & Co., St. Johnsbury, Vt., which marketed them under the name of Dupont. In 1902 the business was taken over by E. & T. Fairbanks & Co., which has been manufacturing them since.

Willis Is Hal Vice-President

DETROIT, Dec. 11—F. B. Willis, who recently resigned as sales manager for the Chalmers Motor Corp., has become the vice-president of the Hal Motor Co., of Cleveland. Mr. Willis will be in charge of the sales, service and advertising and in addition will be assistant to the president of the company.

new preferred stock. There is \$472,300 preferred outstanding.

In their letters to the stockholders the company directors state that they have refused offers for control of the capital stock of the company. The plan, they say, has been approved by stockholders having 80 per cent of the stock. The directors have placed their stock with the Security Trust Co., which will act as depository, and ask that other stockholders do likewise.

Under the plan, a new committee will be formed under the supervision of a committee composed of B. F. Tobin, R. W. Judson, H. J. Warner and A. H. Zimmerman. The new stock issue will be handled by William P. Bonright & Co. and Lee, Higginson & Co. It is stated that the common stock taken by the bankers will be held for investment and will not be offered to the public.

Dividends Declared

Willys-Overland Co., regular quarterly of 1½ per cent on preferred, payable Jan. 2 to stock of record Dec. 20.

E. & J. to Pay Dividend

DETROIT, Dec. 12—The Edmunds & Jones Corp. will pay its third dividend on Dec. 20, amounting to 1½ per cent on the preferred stock and \$1 per share on the common stock, according to a statement by G. D. Edmunds, president.

Pierce-Arrow Pfd. on 8% Basis

NEW YORK, Dec. 13—The Pierce-Arrow Motor Car Corp., Buffalo, has declared an initial dividend of 2 per cent, putting the stock on an 8 per cent per annum basis. This dividend will be payable Jan. 2 on stock held from Dec. 6 to Dec. 31, inclusive. Quarterly dividend payments will be made in January, April, July and October.

Securities Drop on Peace News

Chevrolet Drops 20 Points—United Motors 2 Points Lower—Market Weak

NEW YORK, Dec. 13—News of Germany's peace proposals was the cause of the widest break in stocks in the last 2 years. Heavy selling on the part of professionals was followed by liquidating orders from the commission houses. This selling movement continued until noon, when more than 1,000,000 shares had changed hands. After the second wave of selling, both on the Stock Exchange and the Curb, had receded, motor issues were found to have suffered badly.

Chevrolet was the largest loser with a drop of 20 points, General Motors dropped 7 points, and United Motors dropped 2 points. Stutz went down to 63, National dropped 2 points to 36, and Springfield Body common had a similar drop to 85.

Before the German news had been published, that is, for the week ending Saturday, automobile stocks were fairly active and higher. Ajax Rubber featured the market with a gain of 16½ points on the strength of the deal with the Racine Rubber Co., which is planned to be taken over by it. Ajax Rubber is now quoting at 86½. Stewart-Warner stock will be listed on the Stock Exchange.

Hayes Capital Now \$1,500,000

DETROIT, Dec. 13—The Hayes Mfg. Co., body builder, this city, is increasing its capital to \$1,500,000. The present capital consists of \$500,000 in common, \$135,000 preferred, and \$60,000 in bonds. The company has a surplus of \$440,000

for this year. A part of the increase in capital is a 75 per cent stock dividend, \$625,000 worth of stock being issued in all. Earnings for the 5 months of the current year are \$114,000.

Harrison Radiator Granted Charter

ALBANY, N. Y., Dec. 8—The Harrison Radiator Corp., Lockport, N. Y., has been granted a charter to manufacture radiators, parts and accessories. It is capitalized with 20,000 shares, half of no par value. It will carry on business with \$1,050,000. The directors are Beononi Lockwood, F. A. Gaynor and R. G. Coad. This company was recently taken over by the United Motors Corp.

Phelps Capital to Be \$400,000

COLUMBUS, OHIO, Dec. 9—The capital stock of the Phelps Mfg. Co. will be increased from \$100,000 to \$400,000 in the near future. The company is manufacturing wire wheels for automobiles.

Paige-Detroit Issues \$1,000,000 Preferred Stock

NEW YORK, Dec. 8—The Paige-Detroit Motor Car Co., Detroit, has issued, through Chandler & Co., this city, \$1,000,000 of 7 per cent cumulative preferred stock, par value \$10 a share. The amount authorized is \$1,500,000. The Paige-Detroit company also has \$2,000,000 of common, par value \$10, of which \$1,500,000 has been issued.

The preferred stock will be redeemed at par and accrued dividends at the rate of \$100,000 annually, beginning with Jan. 1, 1918, and ending with Jan. 1, 1927.

For the 13 months ended Dec. 31, 1916, the net income available for dividends was \$609,755; for the 10 months ended Oct. 31, 1916, \$964,442. Ten months'

Automobile Securities Quotations on the New York Stock Exchange

	Bid	Asked	Week's Ch'ge		Bid	Asked	Week's Ch'ge
Ajax Rubber Co.	86½	86½	+16½	Miller Rubber Co. com.	253	258	-2
J. I. Case T. M. Co. pfd.	86½	89½	-¼	Miller Rubber Co. pfd.	106	108	-2
Chalmers Motor Co. com.	135	..	..	Mitchell Motors	55½	55½	..
Chalmers Motor Co. pfd.	105	115	-5	Packard Motor Car Co. com.	173	183	-5
*Chandler Motor Car Co.	110	112	-1	Packard Motor Car Co. pfd.	101	103	-3
Chevrolet Motor Co.	170	180	+5	Paige-Detroit Motor Car Co.	41½	42½	-2½
Fisher Body Corp.	38	41	..	Peerless Truck & Motor Corp.	21	23	-1
Fisk Rubber Co. com.	70	80	-10	Pierce-Arrow	55½	55½	..
Fisk Rubber Co. 1st pfd.	100	110	-10	Portage Rubber Co.	174	..	-7
Fisk Rubber Co. 2d pfd.	90	100	..	Regal Motor Car Co. pfd.	20	30	..
Firestone Tire & Rubber Co. com.	150	152	-12	Reo Motor Car Co.	45¾	46¾	-¼
Firestone Tire & Rubber Co. pfd.	106½	107½	-½	Saxon Motor Car Corp.	76	77	..
*General Motors Co. com.	650	800	..	A. O. Smith Corp. com.	41½	42	..
*General Motors Co. pfd.	113½	120	-6½	A. O. Smith Corp. pfd.	96½	91	+1
*B. F. Goodrich Co. com.	68½	68¾	-1¼	Springfield Body Corp. com.	95	105	+10
*B. F. Goodrich Co. pfd.	111	111¾	..	Springfield Body Corp. pfd.	120	130	..
Goodyear Tire & Rubber Co. com.	293	296	..	Standard Motor Construction Co.	6¾	7	+¾
Goodyear Tire & Rubber Co. pfd.	109	109¾	+¼	Stewart-Warner Speed. Corp. com. ....	..	..	..
Grant Motor Car Corp.	7	9	-1	Stewart-Warner Speed. Corp. pfd.	108½	110	-11½
Hupp Motor Car Corp. com.	3¾	4¾	-¼	*Studebaker Corp. com. ....	..	..	..
Hupp Motor Car Corp. pfd.	80	100	..	*Studebaker Corp. pfd. ....	..	..	..
International Motor Co. new com.	14	18	..	Stutz Motor	63¾	63¾	+¼
International Motor Co. 1st pfd.	60	80	+12	Swinehart Tire & Rubber Co. ....	..	..	..
International Motor Co. 2d pfd.	30	50	+7	United Motors Corp.	59½	59½	-1
Keystone Tire & Rubber.	15½	15½	-¼	*U. S. Rubber Co. com.	68¾	69	-3
*Kelly-Springfield Tire Co. com.	72¼	73	-2¾	*U. S. Rubber Co. pfd.	113	113½	-½
*Kelly-Springfield Tire Co. 1st pfd.	95	99½	..	White Motor Co.	33	54	-¾
*Lee Rubber & Tire Corp.	31¾	32¼	-5¼	*Willys-Overland Co. com.	38	38½	+1¼
*Maxwell Motor Co. com.	70¾	71½	-2¾	*Willys-Overland Co. pfd.	99	99½	+¼
*Maxwell Motor Co. 1st pfd.	79¾	79¾	-2½				
*Maxwell Motor Co. 2d pfd.	47	50	-2				

*At close Dec. 11, 1916. Listed New York Stock Exchange.

operations show net earnings of more than thirteen times the annual preferred dividend requirements.

The company's output has increased from 267 cars in 1910 to 12,456 cars for the year 1916 up to Nov. 25.

McCord \$1,000,000 Stock Issue

DETROIT, Dec. 14—McCord Mfg. Co. has authorized an issue of \$1,000,000 in 7 per cent cumulative preferred stock, of which \$750,000 will be offered at once, and also 75,000 shares of common stock of no par value for immediate issue. The brokers handling the issue are John Burnham & Co. of New York, and E. E. McCrone & Co. of Detroit.

To List Paige-Detroit on Curb

DETROIT, Dec. 8—Paige-Detroit stock will soon be listed on the New York curb, according to statements made by reliable Detroit sources.

Rickenbacher Sails for Europe

NEW YORK, Dec. 12—Ed. Rickenbacher, racing driver, sails for Europe Saturday to visit England, France and Italy to purchase two racing cars for next year's campaign in this country. He goes as a representative of Wm. Weightman, Kenova, Va., who made his debut in racing by driving a Duesenberg in the Astor Cup Race and later won third place in the recent Vanderbilt Cup Race in a Duesenberg. Rickenbacher expects to take the matter up with the Sunbeam Co. and has been approached by that organization to drive for them next summer. He prefers however to purchase cars outright. It is expected that he will visit Fiat and one or two of the French makers.

Boston to Have Salon

BOSTON, Dec. 9—Manager C. I. Campbell of the Boston automobile show today leased the ballroom of the Copley Plaza Hotel for the week of the Boston show in March to hold the automobile salon. While the Mechanics' Building exhibit is to open Saturday night, the salon will not open until Monday night. The exhibitors in the salon will be members of the Boston Automobile Dealers' Association. There will be a limit of not more than two cars for each dealer. Another restriction limits the exhibits to limousines, landaulets, coupes, sedans, etc., with the exemption that no open touring car whose price is less than \$2,500 will be admitted.

Two More Show Exhibitors

NEW YORK, Dec. 12—The Craftsman Motor Co., Chicago, will be an exhibitor at both national shows. The Superior Lamp Mfg. Co., New York, has just been given space at the New York show.

Safety First Advocates Education

Punishment of Traffic Violators Censured at 3-Day Session of Association

BALTIMORE, MD., Dec. 7—Education will do more toward reducing accidents than punishing violators of traffic rules. Such was the keynote of the annual convention of the Safety First Federation of America, which opened a three-day session here to-day. With the ever-increasing volume of automobiles on our streets comes a corresponding increase in the traffic chaos of busy thoroughfares and a consequent need for more ease of movement of vehicular traffic and the necessity for extreme care on the part of pedestrians and operators of automobiles and horse-drawn vehicles alike.

Perhaps the one great message that was brought to the convention came with Joseph Sabath, now superior judge of Cook County, Ill., and former head and originator of the speeders' Court in Chicago. Judge Sabath's experience in handling some 20,000 cases in the speeders' court has given him a knowledge of motor traffic such as is possessed by few, if any, other individuals. It is his opinion that the problem confronting a judge in his former position requires something more than a cold administration of the law, the exacting of fines and penalties, the adding of revenue to the city treasury, something that the administration of the law does not reach—the question of guarding human life. "The levying of fines and penalties is insignificant," said Judge Sabath, "compared with the real service a judge in such a court can render the community if he takes the problem seriously and devotes himself to a study of the question and urges such remedies as his experience shows him to be best for all concerned."

In his plea for education as a substitute of penalization, Judge Sabath declared that the man who is fined usually leaves the court room defiant. His penalty is paid and he owes nothing more to society. However, if the judge patiently and earnestly points out to him the seriousness of his offense, because of its danger to society, his better self responds and he becomes a champion of the work the court is doing.

Summing up, Judge Sabath said that no mercy should be shown an intoxicated driver of a car, for he is a real menace, and a prison sentence should be meted out to him. Among other things he advocated as being necessary for greater safety on our streets are the abolishment of glaring headlights, better regulation

of motorcycles, licensing of every person driving a car and the establishment of a special court in each city to handle violations of the traffic rules and run along educational lines.

Several speakers at the convention advocated that all vehicles be brought to a full stop a certain number of feet—preferably ten—back of a street car that has stopped to take on or discharge passengers, unless there is a safety zone or the street is sufficiently wide to allow the vehicle to pass and give passengers 8 to 10 ft. of space between the car and the vehicle passing.

Education both of the pedestrian and the vehicle operator in the principles of Safety First was the prevailing thought expressed.

Studebaker Six Has 122-in. Wheelbase

NEW YORK, Dec. 13—The wheelbase of the 1917 six-cylinder Studebaker is 122 in., and that of the four-cylinder model is 112 in. In the description of these cars published in THE AUTOMOBILE last week the four was incorrectly given as 102 in. and the six as 112.

Harkness Resigns as Sheepshead President

NEW YORK, Dec. 12—Harry S. Harkness has resigned as president of the Sheepshead Bay Speedway Corp., to take effect at once. No reason is given for his resignation. The speedway made little money this year and Mr. Harkness and other heavy stockholders were obliged to put up much money to cover the heavy expenses.

Analyzes After-War Conditions

(Continued from page 991)

will enjoy greater industrial stability resulting from a broader market."

Laws Must Change Slightly

The present laws, the report says, in many cases as they stand operate to prevent formation of co-operative organizations for export trade. Changes must be made, it says, to relieve the manufacturer of even doubt as to their application in foreign trade organization, but leaving them as at present to protect the domestic consumer against combinations to control prices.

Probably the most important part of the report is that which goes into detail touching the question of legislation under which the American exporter may be protected in his business, once peace is restored abroad.

Several months ago a preliminary report along this line was made by the Trade Commission, and following this action Representative A. Y. Webb, chairman of the House Judiciary Committee, introduced a bill covering the recom-

mendations made by the commission. Mr. Webb said to-day that he is prepared to push his bill at the present session of Congress.

The trade report suggests that unnecessary alarm is being felt by American exporters just at this time because of the fact that high costs of raw materials, increased taxes, probably higher wages, to say nothing of the capital and stocks of material necessary to repair the wastages of war, are expected to delay the full power of European competition until it regains its normal state. But laws to put the American exporter on a footing with his foreign rival by authorization of collective foreign selling agencies are recommended.

In studying the export situation the trade commission, it is declared, has tried to take the problem in its broad, historical aspect, considering the present war as a temporary interlude, the permanent influence of which it is difficult to estimate.

Competition Will Be Sharper

"It is frequently asserted," says the report, "the manufacturers and producers of the belligerent countries will take effective measures to regain their former trade. Such foreign manufacturers and producers may be expected to fully utilize their highly efficient organizations for the promotion and handling of trade beyond their borders, even foregoing profits or taking a very low profit till their costs again become normal and they have re-established their trade. Hence, competition from foreign industrial combinations, aided by foreign ship lines and foreign banks, and backed by foreign governments, may be even sharper than before the war."

Other Countries Considered

The report takes up competitive conditions in most of the countries of the world, devotes a chapter to competition in South America, gives competitive conditions in particular industries, and carries a mass of tables and statistical data concerning trade conditions everywhere.

Detroit Show Space All Sold

DETROIT, Dec. 8—Every square foot of floor-space for the 1917 Detroit automobile show has been sold. More space is available at the Billy Sunday tabernacle where the coming show will be held, than was at the disposal of the Detroit Automobile Dealers' Assn. last year but demands have been so great that members have been held down on space and non-members have been forced to take cut allowances in order to partially meet the demand. As it is, there will be many pleasure car dealers and accessory companies who will be unable to display their exhibits.

Battery Service Discussed

Ind. Service Managers at Meeting—Advocate Co-operation by Garages and Owners

INDIANAPOLIS, IND., Dec. 10—Closer co-operation on the part of garage men and automobile owners with manufacturers as a means of eliminating many storage battery problems as they relate to starting and lighting systems was recommended at the regular monthly meeting of the Indiana Automobile Service Managers' Assn. held here last night. The meeting was attended by about seventy-five persons with members of the Indiana section of the Society of Automobile Engineers as guests.

"The Battery Service Problem" was the subject of a paper read by J. Whyte, service manager of the Prest-O-Lite Co. H. S. Bentley of Cleveland, manager of agents of the Willard Storage Battery Co., read a paper entitled "Proper Care of Batteries on Cars Held in Stock."

The chief topic of discussion among the service managers was the cold weather problems that result from the lack of care of storage batteries, and as a result of this discussion car manufacturers were asked to request their service men, agents, and owners to make the following recommendation for starting cars in cold weather:

Throw the clutch out—do not keep it in neutral position—while trying to start engines in cold weather. By throwing out your clutch you relieve your starting battery of a heavy load, thereby increasing the efficiency of your starting system.

The service managers expressed the belief that not one motorist out of twenty-five knows of or practises this simple rule which would accomplish much in the elimination of battery and starting system troubles.

Earle & Boggs Take Buda Motor

NEW YORK, Dec. 12—Earle & Boggs, 1790 Broadway, New York City, manufacturers' representatives carrying a general line of automobile materials, have been appointed representatives of the Buda Co. in the East.

P. O. Bans Newspaper Publicity (Continued from page 992)

and a similar article which might be an advertisement," said General Dockery. "Cases have been brought to our attention in which these alleged news items, undoubtedly written by the same fellow, have appeared in different publications. Therefore, in view of all the facts, while not saying the newspapers are violating the law, in view of complaints being made we are investigating."

"The construction of this law is very clear, and likewise the evident intention of Congress is very clear. Otherwise, Congress would not have gone so far as to make the violation of it a criminal offense, in addition to the denial of second-class mail privileges to the offenders. This particular feature is a part of the section of the law which calls for the publication, ever so often, of sworn statements as to ownership and circulation. As I said before, I hope the letters I am sending out, together with the possibility that I may have to call some of the offenders before me, will suffice. If not, I am then required by the law to have recourse to the courts, and the procedure would be to refer my complaints, together with the information obtained by me, to the United States District Attorneys in the territories where offenses seem to have been committed."

General Dockery then continued to discuss in an interesting manner his views as to the line of demarcation already referred to. He said, in this connection, that if a news notice and a display advertisement are run at the same time, and the two are apparently connected, the natural presumption would be that the news notice is in effect an advertisement, and if not so marked would be a violation of the law.

Traffic Men Indorse N. A. C. C. Methods

DETROIT, Dec. 13—Twenty-five traffic managers of leading automobile companies met here yesterday and voted to approve the methods of the National Automobile Chamber of Commerce traffic department for relieving freight congestion.

Madison Square Garden Sold

NEW YORK, Dec. 11—Madison Square Garden, the cradle of the automobile industry and the scene of exhibitions and spectacles of all descriptions for the last twenty-six years, has been put up on the block. Last week it was sold for \$2,000,000 to the New York Life Insurance Co. Lovers of the staid old structure had visions of a modern building in its place, but the insurance company has since expressed its intention of selling it, so there is a slight chance that the building will continue to be for exhibition purposes.

In Madison Square Garden was held the first automobile show of this country. This was in 1900, and for thirteen consecutive years the place was the setting for the local national show. Each time since that rumors claimed the sale of the Garden. When the industry enlarged and more room was needed to harbor the show, a worthy successor to the historic old building was found in the Grand Central Palace.



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Carbureter Demands

THE attitudes of the purchasing agent and the engineer of an automobile factory are typical of the problems the carbureter maker of to-day has to solve. The purchasing agent looks upon the carbureter as a necessary piece of brass which must be bought to make the car complete, but which, like all other equipment, must be bought at the lowest possible figure.

On the other hand, there is the engineer, who knows he has a fine power plant, but must have the best possible carbureter in order to bring out the power of which it is capable. He wants 3 m.p.h. on high. He wants quick starting after a night in a zero-temperature garage. He demands acceleration from 3 to 30 m.p.h. in a city block, and all this at a reasonable economy figure and with a high peak on the power curve.

To meet these standpoints of the purchasing agent and of the engineer offers a problem that does not tempt the faint-hearted. In fact, more than one carbureter maker who believes that he has a good instrument will not even attempt to bid for factory business. Instead these manufacturers go after the retail trade, and more than one are successful.

To be a commercial success, however, the carbureter of to-day is like the rest of the car. It must not only be designed to do its work in the best possible manner, but it must be a commercial proposi-

tion which adapts itself to quantity production. It must not have to be hand-filed and lapped after entering the assembly room. It must come through so that the assembly is a matter of course and not a matter of expediency. Every carbureter, in other words, must go through alike and not be hand fitted in the assembly process.

City Exits

THE wider use of the automobile is restricted to-day due to several of our largest cities not having adequate exits and further not having adequate streets leading into the main business centers from residential sections. The first situation, that of insufficient exits, is serious. The automobile has largely changed the face of city life. The man of wealth no longer lives where he was 10 years ago. The street he then lived on is to-day a fashionable business street. His residence is now 15, 20 or 30 miles out. The railroad train is at his service but many prefer the automobile. The use of the automobile for such service will increase, but its increase will largely depend on the street facilities. If an hour or more will be needed to get out of the traffic zone as at present in some cities, then the automobile's use in this respect will be unfortunately restricted. What is needed is a wide street, preferably with double roadways and if possible no trolley crossings. This is impossible in some cities but it is not improbable that there will in the next 10 years be elevated roadways for motor travel leading out of our cities. The automobile is of sufficient importance to-day to demand such. In at least six or seven largest cities the elevated motor road is not only a possibility, but very much of a probability. New York, Chicago, Boston and other cities need such to-day. New York is perhaps the easiest city to get out of in America. On the other hand, Boston and Chicago are among the worst. Wider exits are questions that our makers should give attention to, and they are problems that can be handled better and cheaper to-day than 10 years hence.

A. C. Newby

THE withdrawal of A. C. Newby of the National company from the active management of the company is an opportune time for rendering unto Caesar that which is Caesar's, etc. Mr. Newby, while not one of the most conspicuous figures in the automobile field, has been a good representative of that conservative element in the industry which has served so as a stabilizing influence throughout the varying vicissitudes the industry has passed through. He was one of the pioneers in the field, first with the electric vehicle industry and then with the gasoline type of vehicle. Every manufacturer has admired that stalwart spirit of honesty which has been a part of every word and action of Mr. Newby. In the automobile contest field the same spirit had an inspiring influence and Newby was a force for good in automobile racing at a time when such an influence was highly essential.

Germany After the War

By Edward Allen Langdon*

- ¶ Germany has all told nearly 300,000 automobiles in use to-day.
- ¶ Germany is now using approximately 160,000 automobiles in the war—one-half on the Western front, one-fifth on Russian, and the remainder in the Near East.
- ¶ There will be a demand for 300,000 to 500,000 automobiles in Germany after the war closes.
- ¶ After the war it will be impossible to market automobiles in Germany unless there are good U. S. A. service stations there.
- ¶ Germany will buy automobiles as a unit and not as individuals after the war.
- ¶ Germany will offer a good market for U. S. A. accessories and parts.
- ¶ Adoption of metric system of measurement will gain headway after the war.

GERMANY, while carrying on a warfare admitted to be highly efficient by her very enemies, is already making extensive preparations for the time when peace shall have been restored. This holds good of every department of national life, industry, finance and trade, as well as agriculture and countless illustrations of this activity could be cited. Instead, the following remarks will be limited to the automobile situation, and particularly to those phases thereof which are of necessity of practical interest to American makers and exporters of automobiles.

160,000 Cars Used by Empire

While the official figures are impossible to obtain, thanks to the intense secrecy which surrounds all data of any direct or indirect military importance, the ideas of people unofficially in touch with the situation indicate that the State, i.e., the Empire, is now using close to 160,000 automobiles. One-half of these are in service at the Western front, one-fifth along the Eastern front between Riga and Lemberg and the remainder along the Rumanian and Saloniki fronts.

Besides, there are now in Government service perhaps 50,000 machines for carrying officials and industrial products in Germany herself, and perhaps the same number is employed for private purposes. In all, there are in Germany between 250,000 and 300,000 motor vehicles, and as these are being used up the supply is being replenished; but there is hardly any increase of the total number, because the automobiles on hand are sufficient for German requirements, and also because the raw materials are more urgently needed in the making of munitions, which industry during the last few months has been pushed more energetically than ever before.

The automobiles, the number of which is practically constant, will however not be considered efficient when the war

is over and money once more will have to be reckoned with. For this reason it is safe to predict that after the war two-thirds of the automobiles will be replaced by new ones, and it is understood that this will be done on the following plan. The Government will keep the machines commandeered during the war, to be rebuilt and used, either for public works, or to be sold practically at cost to small agricultural individuals or concerns, so as to facilitate farming. On the other hand, the former owners of these cars will receive a Government subsidy of from 45 to 65 per cent toward the purchase of new automobiles built in Germany along standard lines and approved in their specifications by the Imperial Government. Thus, there will be a sure demand in Germany, immediately after the war, for about 200,000 cars.

Horses Are Scarce

But this is not all. Before the war, horses were still extensively used in German cities as well as in the country. They are now very much decimated and it is doubtful whether raising horses will be favored by the Government, and it must be understood that Government control of all economic affairs is a thing growing in Germany by leaps and bounds. Horses have not only proved vastly inferior to motor equipment, but were also somewhat of a disappointment to the German stomach. Very likely all the energy formerly turned toward raising horses will, after the war, be devoted to cattle breeding, and the millions of working horses will have to be replaced somehow.

A 1,000,000-Car Market

If the war ends within a year, assuming developments somewhat similar to the past, Germany will have a population of 60,000,000 people when peace is made. The Empire will then be a highly industrial country and therefore require ample facilities for transporting passengers and merchandise. If the demand will be for one machine to every sixty of the

*Editor's Note—Edward Allen Langdon has for many months been in different parts of Europe studying automobile conditions in those countries. Mr. Langdon is a critical student of conditions. He is making a comprehensive study of trade and all his utterances savor of conservatism.

population, the market will call for a million automobiles, of which Germany will be able to supply, with international conditions restored to normal, from 50 to 70 per cent. There still remains a market for from 300,000 to 500,000 automobiles of simple, strong construction, efficient in operation and moderately priced which could be supplied by American exporters.

Points to Be Considered

Following are the points to be considered by German buyers:

1—*Fuel Economy.*—Efficient operation will be as necessary after the war as it is now. Taxation will be high, there will probably be a general and fairly high tariff, and every cent will count.

2—*Durability.*—Automobiles will be driven by careful, well-taught drivers, of whom there are now hundreds of thousands, thanks to the army training. Nevertheless, each automobile will always be worked to its full capacity, and wherever seven-passenger touring cars or five-ton trucks are bought, they will be expected and called upon to prove their true character every minute of a working day.

3—*Diversity of Fuel.*—It is quite likely that industrial alcohol and benzol will be cheaper than gasoline after the war, as they were already before its outbreak. Other things being equal, motors adapted for such fuels will have a point in their favor over ordinary gasoline motors.

4—*Agricultural Field.*—Many thousand of cars will be required which are of the passenger type, lightly built, of 18 to 24 hp. and adaptable to driving agricultural implements, such as ploughs, hoes, spreaders, etc. These machines will have to be very simple and very strong in construction and it will be necessary to not only give clear demonstrations of their ability to do the work, but to submit doubtless proof of past performances.

5—*Passenger Cars.*—They should be completely equipped, with self starters and electric lighting, high-tension ignition and substantial tires.

6—*Trucks.*—Simplicity of design and strength will be the chief features looked for, but starting and other equipment will count, as many machines will be driven by women who have now assumed a definite position in Germany's industrial life. Electric trucks will find a specially good field in the industrial cities.

Service Absolutely Necessary

7—*Service.*—It will be almost impossible to market an automobile in Germany, unless there is a service station including a complete stock of repair parts within the Empire.

It is now almost certain that Germany will buy abroad, and perhaps also from importers in the Empire, as one corporation, with the double advantage of eliminating competition among bidders and also of enormously reducing overhead expense. This does not mean, however, that trading with Germany will not be profitable; only, it will be necessary for American business men to meet efficiency with efficiency. In other words, if Germany's automobile industry and the users of automobiles in Germany will face the world market as a solid financial unit, Americans will have to adopt the same policy, at least in dealing with Germany.

Co-operation Favored

The German Empire does not know the reactionary unscientific legislation against progressive concentration in business and rather favors than hampers it. Therefore, American automobile dealers in Germany can quite well work together, conducting a permanent automobile exhibit in Berlin, Frankfurt-on-Main, Leipzig and one or two more of the most important centers, using corporate advertising and letting their salesmen work hand in hand, distributing the products of all the companies to best advantage.

As has been said, taxation and duty will be high in Germany after the war, and only very efficient management will be able to successfully combat these handicaps. Duty on chassis and cars will most likely be higher than on automobile parts, and here the opportunity for the parts manufacturer begins. Motors, axles, steering and transmission gears, which America can easily supply, and which would come up to Germany's demand both in regard to quality and quantity, should find a ready and highly profitable market in the German Empire.

The same holds true of certain classes of equipment, especially electric starting and lighting sets. There is less opportunity for makers of speedometers and particularly delicate instruments, as the class of labor required for such manufactures is specially cheap in Germany.

Look to U. S. A. Industry

To some people consideration of all these points may seem premature, but if Germany who is at war considers them of sufficient importance to give them at least initial attention, American manufacturers ought not to overlook their possibilities. In fact, when the magnitude of this field is considered and that the business to be done is bound to amount to hundreds of millions, it is not surprising that Germans engaged in the automobile business are expecting the American industry to take well-organized steps toward capturing the lion's share of this business.

If the U. S. A. automobile industry, as a body, should approach the German government, it would in all likelihood succeed in obtaining for the buyers of U. S. A. cars, if not the same, then at least part of the subsidy extended to purchasers of native cars conforming with Government specifications. Perhaps, if the Government should feel unwilling to take such a course, an agreement could be obtained for a short term, say 2 to 5 years.

Getting a Foothold

Even if the market for American cars should be made more difficult after such an introductory period, many users would thereafter stick to the American product if it gave them satisfaction. This point, of getting a foothold in Germany immediately after the war, is the more important, as interests across the Channel will hardly be sentimental enough to sidestep profitable business with Germany, and as the very machine tools now making munitions against the Empire will then be used for making other, and marketable, products.

Before the war, Germany was England's best customer; after the war, if she can do so without serious loss, she will prefer to buy from others than her former enemies wherever possible, without declaring any distinct trade war.

Subsidies Are Possible

This immediately brings to the light another point, which is only of indirect bearing on the automobile situation, namely, that subsidies for cars built along lines approved by the Government will, as has been mentioned, be continued vigorously. This, however, indicates nothing more or less than the preparation for a renewal of the conflict now going on. As a matter of fact, well-informed Germans even to-day admit that, while they are perfectly confident as to the result of the war, they do not expect it to bring a definite decision; but they do expect that when the struggle is renewed they will have more friends among the nations than before the present war. From this viewpoint, Germany will very likely be ready to make greater advances in its trade relations to America than in the past, and this will be specially true where products of military value, such as automobiles, are concerned.

Another point to be remembered in dealing with Germany is that unless the war will continue to the utter exhaustion of Europe, its end may find Germany dominant in the Near

East, directing the affairs, in a larger sense, of not only Austria-Hungary and Bulgaria, but of Turkey, the Balkans and very likely Italy, with a strong influence in Scandinavia thrown in. Therefore the relations of any power with Germany will materially weigh in determining its dealings with the countries belonging to the German sphere of influence, which sphere during the past 18 months has been constantly increased. From this viewpoint, too, German business will pay.

Present Conditions Temporary

There are quite a number of materials formerly imported into Germany but now not available, due to the blockade. For most if not all of these serviceable substitutes have been found and the Germans are as a matter of course very enthusiastic over all these discoveries. There is no doubt, however, that a great many of these substitutes though they made fine makeshifts will not prove commercial when peace returns; although it may be that with some additional experimenting and study they may develop into profitable propositions. The fact that an article found extensive use during the war has almost nothing to do with the possibility of producing it profitably, or even, for that matter, without a loss.

It must be remembered that the consideration for profit, at least from the State's point of view, is being completely thrown to the winds for the time of the war's duration. The Government pays liberally for everything, money circulates at a very lively rate and everybody makes plenty of it. But, as remarked, these conditions will almost instantaneously cease with the war. Hence, a great many effective substitutes unless profitable in competition with the original articles will disappear.

Rubber Most Important

The most important of these products, so far as the automobile industry is concerned, is rubber. The Germans claim that they are now using a lot of synthetic rubber, and from the fact that automobiles are equipped with the necessary tires, it would seem that their statement is correct. It is not so certain, however, that the production of the synthetic product will be able to continue after the war, in competition with natural rubber; and here, too, there may yet be a very great field for American manufacturers. The competition in the normal European market, so far as tires are concerned, includes a considerable supply of English and French made goods; for which reason the above remarks, referring to the need of Americans being awake to the very earliest trading opportunities offered by Germany after the end of the war, hold true in the tire field also.

Parts and Accessories in Demand

When the chance and probability of hundreds of thousands of American cars being sold in Germany, is considered, it follows that reserve parts and accessories, from springs to spark plugs, will find a ready market here, too, as long as these American cars are used and continue to come in. Accessory and parts makers and tire exporters, for that matter, also will do well to consider the same principles of economy and efficiency in German exporting as were laid down in the foregoing remarks for makers of automobiles.

Poland May Develop

The European war, reducing Europe to two spheres of interest and influence, as it is bound to, will also bring into prominence once more the world-wide adoption of the metric system. There is a considerable probability, according to the opinion not only of German but of neutral engineers as well, that England will very soon and completely adopt the general use of the decimal system for weights and measures. This will be one of the minor effects of the war, but will be of considerable bearing upon international trade in prod-

ucts made according to mathematically exact measurements.

Although officially independent of Germany, the new Kingdom of Poland, one-quarter as great as Germany and populated by almost 15,000,000 people, will present a noteworthy market resembling in many respects that of the Empire itself. Poland is a rich grain country, although the population up to now has been anything but prosperous, and very likely will now be developed not only to greater agricultural efficiency, but also into an industrial section of quite some importance. The country is level and the roads not as bad as 2 years ago. The Germans are already doing a good deal in modernizing conditions and soon after the war Poland ought to offer a good market.

In a way, this holds true of the Balkan States, too, which have once more been roused to more modern ideas and methods by the war. No matter what the political distribution after the war, the territories now known as Servia, Bulgaria, Rumania and Greece will be in the market for all sorts of modern appliances, including automobiles and kindred products.

Must Begin Now

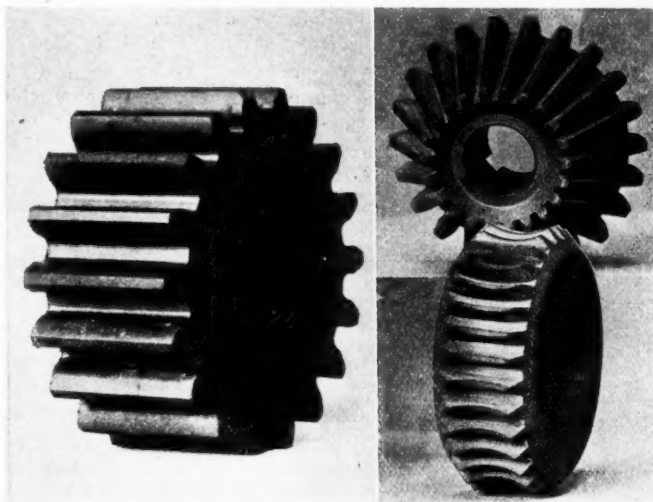
As has been stated in the introductory paragraph, only the most striking features of the situation now developing in Germany are given attention here, and a great deal will be left to the ingenuity of American business men regarding the best way of getting the business to be obtained in the Empire and its Confederate States. Too much stress, however, cannot be laid on the point that conditions should be studied and plans outlined—as far as possible—now, without waiting for the end of the war. Capable people should be despatched to the Continent to look matters over and so far as can be done now, prepare for commercial relations to be taken up as soon as normal conditions are restored again. The earlier this is done, the more favorable will be the conditions American manufacturers will be able to obtain in dealing with the authorities handling these matters.

After the War

To sum it all up in so many words:

After the war, more than ever before, the devil is bound to take the hindmost; and the hindmost will be everybody who will fail to realize very early that the whole fabric of European economic life is being completely rewarped by the war.

Westinghouse Noiseless Bakelite Gears



Examples of gears made by the Westinghouse Electric & Mfg. Co. from Bakelite-Micarta-D. This material is claimed to be almost noiseless in operation and to be so strong that it can be used without metallic inserts for timing gears. It machines easily, takes a high polish and is not affected by oil.

Four Is Ultimate Engine

Sixes, Eights and Twelves Have Special Uses but Four Is Automobile Engine of Greatest Value—Production Restricts Development

By A. P. Brush *

ISN'T the four-cylinder engine coming back? Will the four-cylinder engine ever come back? As a matter of fact, the four-cylinder engine isn't coming back and never will come back. Such a thing is impossible, for the very simple reason that it has never gone out.

Considered solely from the standpoint of numbers, the four-cylinder engine is, and has been for the last 10 years, the standard prime mover for self-propelled road vehicles and, in my judgment, will continue to be so long as the four-cycle internal-combustion engine holds its place as the most satisfactory prime mover for mobile use. Other engines of the four-cycle internal-combustion type, such as the six-, the eight- and the twelve-cylinder forms, are more or less special engines built for the purpose of securing results outside the range and capacity of the four.

Naturally the question will suggest itself, if the four-cylinder engine is susceptible of development and improvement, and if it is even numerically the most popular engine and has the greatest amount of capital invested in its production, is it not reasonable to suppose that its development has been carried further than that of any other mobile prime mover?

Multi-Cylinder Development

It is my opinion that the six-, the eight- and the twelve-cylinder have all been developed more nearly to their ultimate possibilities than has the four-cylinder engine, and it is also my opinion that the greatest obstruction to the development of the four-cylinder toward its ultimate possibilities has been and is its very popularity. *Volume of production makes for efficiency of production and stagnation of development.*

The production engineer has carried his work nearer to the ultimate with respect to the four-cylinder than with respect to the six, the eight or the twelve, but to secure this result the production engineer has been an obstructionist as regards the development engineer. With his face set firmly in the direction of efficiency in production, he has been, with equal fixedness, opposed to change, because change is the arch enemy of production efficiency.

Progress in design, so far as the large-quantity manufacturer of four-cylinder-engine cars is concerned, may be said to originate only in the minds of the sales department, finding its expression in their effusions, to the end that it may exist as an hallucination in the mind of the ultimate consumer.

Production vs. Engineering Progress

While the foregoing may sound like an arraignment of the large manufacturers of four-cylinder-engined cars, I for one do not consider it as such. The efficiency of production that has been achieved was only possible because of this artificial stagnation in engineering progress. My only purpose in bringing these conditions as regards the four-cylinder engine to your attention is that these conditions are, to my mind, justification for the statement that relatively more progress

can be made in the design of the four-cylinder engine than in any of the other types.

A Commercial Angle

There is another very real obstruction to the development of the four-cylinder engine. It has come to be accepted as the engine for the extremely low-priced automobile. It is, of course, possible that these Kresges and Woolworths of the automobile industry are producing the only marketable type of light-weight car of limited passenger capacity. That is a commercial rather than an engineering question and, technically at least, outside our consideration at this time. For use in the so-called pleasure type of automobile the four-cylinder engine is pre-eminently the engine to be used in light-weight cars whose ultimate owners are their own chauffeurs and mechanics. Right here I want to venture the opinion that this class of user is entitled to, and a considerable proportion are willing to pay a reasonable addition for, better car performance and higher comfort value combined with the same or greater simplicity and compactness of mechanism.

Let us consider first the question of performance. Four of the leading manufacturers of four-cylinder cars claim for their engines maximum horsepower per cubic inch of piston displacement ranging from 0.142 to 0.206, with total piston displacements ranging from 170 cu. in. to 213 cu. in., and maximum total horsepowers ranging from 25 to 35.

During the past year a four-cylinder engine has been designed, tested, and its production in a light-weight car has been arranged for. The cylinder dimensions are 3¼ in. by 4½ in., giving a piston displacement of just under 150 cu. in. Its maximum power, as determined by exhaustive dynamometer tests, is just over 44, giving a horsepower per cubic inch value of 0.29. Comparing this with the best four-cylinder engines previously referred to, you will find an increase of over 40 per cent in power output per cubic inch of piston displacement and an increase of over 25 per cent in total horsepower available.

Performance the Question

Comparing maximum horsepower output does not tell the whole story. Good performance in an automobile means, in the engine, a high power output throughout a wide percentage range of speed. In this respect this little engine probably surpasses its popular predecessors to at least an equal degree. Owing to the absence of published power curves I cannot make a direct comparison in this respect. I can only tell you that it excelled the maximum power output per cubic inch of its predecessors throughout a range of over 2000 r.p.m.; that is, it developed over 0.2 h.p. per cubic inch from 400 r.p.m. to 2600 r.p.m. Because of its smaller cylinder diameter, and, further, because of the fact that it is of the two-bearing-crankshaft type, this engine occupies much less room in the car than any of the other engines used for comparison. This means, of course, either more passenger room and comfort for a given wheelbase or the same passenger room and comfort with less wheelbase. These comparisons,

*Paper read before Buffalo Engineering Society, Dec. 13.

I think, clearly demonstrate the possibility of increased performance values in the light-weight four-cylinder car.

Now, let us see what are the results in comfort value. The objectionable characteristics of a four-cylinder engine are vibration at high speed, due to the weight of the pistons and the angularity of the connecting-rods, and another class of vibration which may be described as torque vibration, due to the relatively heavy and infrequent torque impulses at very low speeds. Obviously these smaller cylinder dimensions mean a reduction in piston weight, with a consequent reduction in vibration tendencies at high speeds, and because of its greater speed range it is obviously possible and advisable to use a lower rear-axle gear ratio, which means, of course, greater frequency of impulse and therefore less torque vibrations at low speeds. This marked increase in performance and comfort value has been secured with no increase in the complication of the mechanism which the owner-user must understand and care for, and production efficiency is equal, with very little if any increase in engine cost.

Valves Are Adequate

To avoid making this paper too long I shall give you only the briefest possible résumé of the essential details which were the means employed to secure the results outlined. The little engine is of the overhead-valve type, and, by the omission of valve cages and some other minor details of arrangement, valves of adequate size were used. Having secured

valves of adequate capacity, the next problem was to secure a carbureter and manifold arrangement which would give somewhere near maximum power at high speed and not destroy the engine performance at low speed. This result was secured by means of what may be described as a low-velocity down-draft dry manifold.

The Lubrication Problem

The next difficulty encountered was the failure of conventional lubricating systems to function properly in an engine of large power output and extreme speed and power range. This difficulty was overcome by using an oiling system which automatically controls the temperature of the crankshaft and its bearings, which gives a positive delivery of oil to the crankshaft and crankpin bearings, and which is interconnected to the engine throttle so as to vary the oil pressure with variations in power output.

To secure compactness the center bearing of the crankshaft was omitted, distortion of the crankshaft at high speed being prevented by fully counterbalancing the shaft and also by the use of an extremely rigid shaft, the crankpin diameters being $2\frac{1}{4}$ in., with crank cheeks of equal rigidity. I have given you this brief outline of the results obtained in this engine and the essentials of design by which these results were obtained, not as an example of ultimate possibilities but simply as one example showing a substantial advance toward that ultimate.

Warming a Manifold for Using Heavy Fuel

A SIMPLE method for warming up an induction manifold so as to enable an engine to be started on kerosene or something nearly as heavy without the use of gasoline, is described in a recent issue of *Motor Traction*, London, as the Wilkes method.

"The apparatus (which has been patented), as will be seen from the illustration, is an exceedingly simple and valuable asset. The small methylated alcohol stoves which are used in many households for the emergency warming of a small saucepan or kettle are well known, and it is this principle which has been adopted for warming up the induction pipe prior to starting.

"The arrangement consists of shallow metal circular or annular cups attached by suitable clips to the induction pipe immediately above the jet. The base of these circular cups is filled with asbestos wool or similar material, which is covered on the upper surface with fine wire gauze. Into these cups is poured the substitute or other suitable fuel, which impregnates the asbestos wool; this is ignited by means of a match or otherwise, producing a flame which burns for some time around the induction pipe, warming the latter sufficiently to obviate condensation, assisting the vaporizing of the liquid from the jet, and thereby rendering starting quite easy. In practice the time necessary on a standard

Zenith carbureter for starting from dead cold has, we learn, been proved to be only 3 min.

"For purposes of running when once the engine is started, it is desirable to fit an exhaust-heated pipe immediately over the carbureter jet, so that vaporization of the fuel is assisted, such additional exhaust pipe being included in the patent specification.

"We understand the apparatus has been thoroughly tried and has proved most satisfactory in practice. When once the engine has been warmed up it will usually restart within a reasonable period by use of the handle only in the usual way."

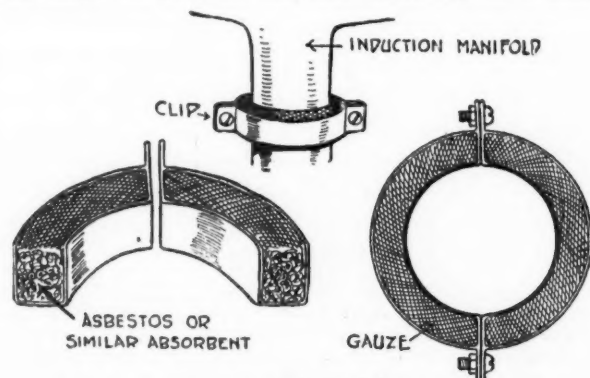
Committees on Welfare Work at Reo Plant

THE Reo Motor Car Co., Lansing, Mich., is devoting many efforts toward welfare work for employees. A number of interesting and valuable methods devised to aid workers have been installed. The welfare work branches into a number of different departments and is done under supervision of department heads or by committees of men and foremen.

The safety committee comprises a chairman who gives his entire time to this work, and seven members each representing a division of the factory. Through this committee a constant oversight is maintained on the machines and safety appliances and the practices of the employees using them. Financial aid is given men, first through a fair wage, the minimum at the factory being 30 cents an hour. And a man in financial trouble receives additional help if the case is worthy by means of temporary loans or adjustment with the creditors.

A real estate committee advises employees in the purchase of homes or the sale of real estate and is a great aid to foreigners unacquainted with conditions.

The company also maintains a first aid and hospital service, an industrial hall seating 1600, four bowling alleys, a library and dining rooms. They are at present erecting a clubhouse for employees which will probably be completed in December.



Details of Wilkes method of starting on heavy fuel

Pressure Lubrication Advantages

Theory of High Pressure Oil Feeding Borne Out by Experiment
—Difficulty in Applying Very High Pressures to Automobile Engines—Importance of Cooling Effect of Oil on Bearings

By A. Ludlow Clayden

THE reason that splash lubrication is still more used than the pressure system is not entirely because the former is cheaper to manufacture. In an automobile engine the problem of keeping oil out of the cylinders has been more absorbing than the other problem of insuring enough for the bearings. With splash oiling it is easier to prevent over-lubrication than with a pressure system, and splash oiling will, when well designed, give the bearings a supply sufficient to insure a reasonable life for the bushings.

On the other hand, bearings fed with oil under high pressure will outlast similar bearings fed by splash; they can be made almost everlasting. Engines have been built in which the crankshaft and connecting-rod bearings were able to keep their original tightness for 50,000 car miles. Give such an engine enough clean oil at regular intervals and you can almost forget that it has any bearings in it. Of course engine bearings in any good motor require renewal only at long intervals, so that they are not very costly to keep in repair, but everything that can be done to lengthen the period during which a car will run without mechanical attention is worth doing. Rear axles used to need tearing down and inspecting every 5000 miles or so. Now they will operate for years without any adjustment. It is but seldom now that a gear in the transmission has to be replaced, and ball and roller bearings have reached a pitch of perfection that enables them to outlast the gears. Even clutch facings now last an immense time, and the only part of the electrical equipment that needs much attention is the battery.

The day is in sight when an automobile will run for five years with no more attention than supply of lubricant and perhaps an annual wash out with kerosene before filling up with fresh oil. This is the reason why it is worth while to try to improve upon engine lubrication, which is already quite reasonably good.

From the viewpoint of the bearings in an engine we should design the lubrication without regard to the cylinders and, having cared for the bearings properly, we can then devise means for preventing cylinder flooding.

Theory of Pressure Oiling

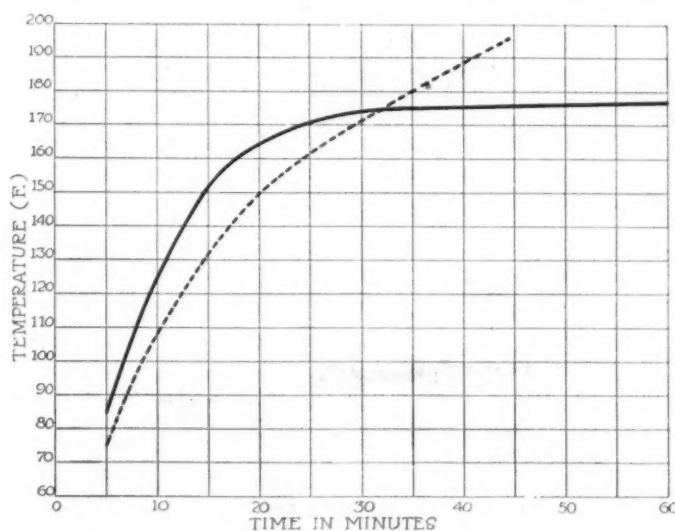
The theory of lubrication has made a study for engineers of all nations for many years, and there are points which are still undecided. There are, however, a few simple rules which are accepted as fundamental.

1. Frictional resistance of a bearing decreases as the thickness of the oil film increases.
2. The loading for a given speed must not exceed a certain limit at which the oil film breaks down.
3. This limit is raised by making the bearing longer, because this increases the cooling effect of the oil.
4. The oil temperature varies throughout the bearing, being greatest where the oil film is thinnest.
5. Oil grooves placed wrongly may destroy the continuity of the film and so actually prevent proper lubrication whatever the oil supply.
6. A bearing with a reciprocating load is easier to lubricate than one with a constant load, as the relief of loading

allows the entrance of oil (if it were not for this, splash lubrication for automobile engines would be impossible).

The value of pressure lubrication is mainly explained by item 1. We can regard the shaft and the bushing as being separated by a thin layer of jelly. When the load comes on, this jelly will be compressed on one side and allowed to expand on the other. Now, with a lubricated bearing the shaft and bushing ought not to touch. The frictional resistance is due to the force required to "shear" the oil film. The power required to do this decreases as the film grows thicker. Returning to the jelly illustration, it is obvious that the amount which the load would move the shaft relative to the bushing must depend upon the strength of the jelly. If the jelly is viscous it will resist displacement better than if it is thin. Actually, in a bearing, the effect of shearing the oil film is to heat the oil, thereby reducing its viscosity. If we can remove the oil as fast as it is heated, replacing the hot oil with cold lubricant, the viscosity can be maintained, and the shaft kept more nearly concentric with the bushing.

The function of pressure is to compel the continuous change of oil in the bearing. The cold oil being forced in drives the hot oil before it, giving it a chance to recover its viscosity before it returns to the bearing again. It is also beneficial in another way. Regarding the bearing as containing oil that can only escape at the ends, we see that the outlet consists of two narrow rings equivalent to a slit, twice the circumference of the bearing in length, and of a width equal to the clearance between the shaft and the bushing. No liquid will flow through a slit or other orifice in direct proportion to the pressure behind it, but in a proportion that decreases as the pressure rises. If a certain quantity flows



Effect of circumferential groove in bushing in reducing temperature. In this test the most efficient cooling, as shown by the full line curve, was obtained with a simple central groove to feed oil under the 40 lb. pressure. The other curve shows the greater rise of temperature when oil was fed to two longitudinal grooves close together and connected

out when there is a 5-lb. pressure behind, then less than double that amount will escape when the pressure is 10 lb. When the pressure on the oil supply is small the bearing is not kept completely full. With splash oiling, for example, the oil enters by suction of a sort. The oil in the bearing is squeezed out by the load on the shaft, and a partial vacuum is left in its place. This enables the atmospheric pressure on adjacent oil to drive it into the bearing, so displacing the vacuum.

Now with pressure-fed oil the bearing is kept permanently full, which means that the oil film is always as thick as possible; there are no variations in film thickness except those due to the oscillations of the load. Experiments made on bearings have shown that the friction decreased steadily as the oil pressure increased. In one particular experiment made on a steam engine giving 120 hp. at 450 r.p.m. it was proved that the friction horsepower was 3.33 with splash-fed oil and that this dropped to 2.13 with an oil pressure of 30 lb. per square inch, a steady fall in friction being noticed as the oil pressure was raised in small stages from nothing up to 30 lb. This is just one from a long series of similar experiments all showing the same thing, namely, that the power absorbed by friction in a bearing decreases as the oil pressure increases.

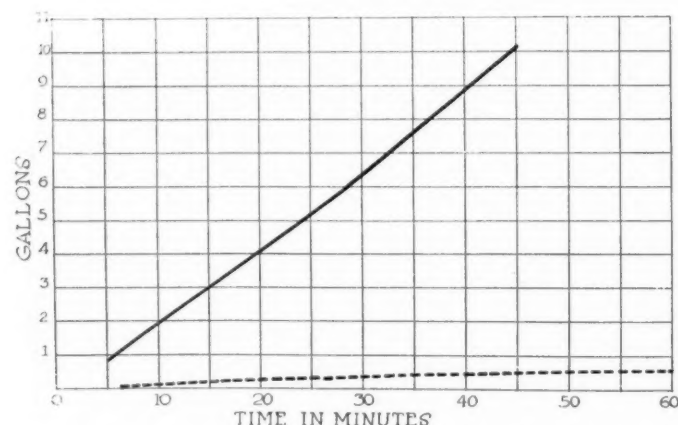
Precisely why this is remains a matter for argument, but some idea of the effect of high pressure oil may be obtained from the following analogy, which is not strictly a parallel case, though it serves to show the idea.

Suppose we regard the oil film round the shaft as a pneumatic tire and imagine that a series of rapidly varying loads are put on the shaft; then, obviously, the greater the pressure in the tire the less will the shaft move as the loads vary. If the tire is soft a big load may absolutely flatten it, driving out all air at one place; if the tire is hard this will not happen.

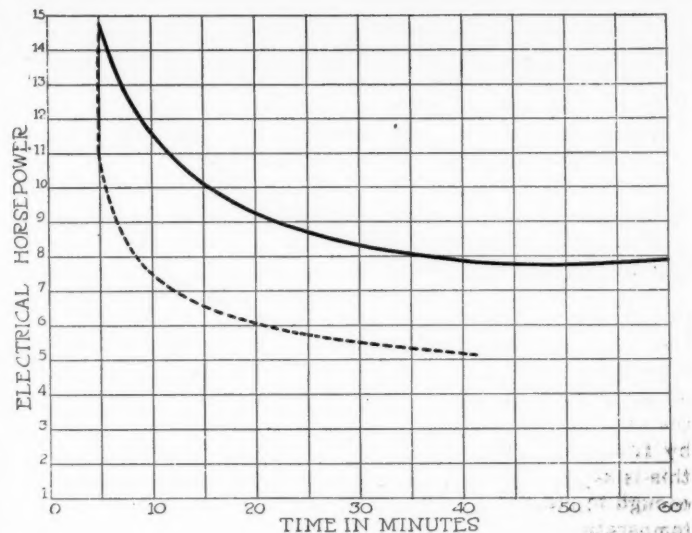
So with an oil film; one under high pressure will keep the shaft away from the bush while one under no pressure may be broken down by a sudden heavy load. An oil film in a bearing may be likened to the tire mentioned above, but with a constant leak in it, so that air is escaping all the time and has to be replaced.

Pumping Action of Bearing

Luckily, a rotating shaft in a bushing is itself an oil pump. If it were not, lubrication by any other method than forced oil would be impossible. To use another rough analogy, suppose the shaft to have a series of blades on it and to be floating central with the bushing with the tips of the blades just clearing the bushing. Now put a load on the shaft so as to

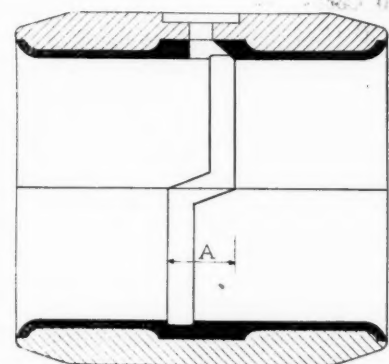


These curves show the relative quantities of oil passed by the two systems of grooving the bushings. The bearings are the same as those used for the test of increase of temperature with time of running, showing that the lower temperature is due to the larger amount passed with the central, circumferential groove



Above—Curves from same pair of bearings showing the electrical horsepower taken to drive the shaft under load. After the state of equilibrium had been reached the bearing with the more copious lubrication required more power to drive it, but the bearing with the restricted supply was too hot to be safe to run further after 40 min.

Right—Groove for obtaining the best flow of oil in a bearing supplied with oil under pressure



displace it relative to the bush, and we see that the space between the tip of the blade and the bush will be greatest on the side of no load and least on the side where the bush is supporting the shaft. Now imagine the shaft to be turning and the oil clinging to the surface of the bush. A blade descending toward the place of least resistance will be carrying a certain quantity of oil before it, and as the clearance decreases some of this oil has to escape. But the nearer the blade gets to the bottom the narrower will be the clearance through which such escape can occur; thus the pressure in the oil at the point of smallest clearance will be a maximum. In actual fact the point of smallest clearance is *not* directly opposite the point of loading, except when the shaft is not turning. The shaft carries the point of maximum oil pressure a little past the point opposite to the load, the exact location depending upon the speed of rotation.

There are several factors, the size of the shaft and length of bearing, the load, the speed of revolution and the viscosity of the oil. For any particular case, all things being settled except the load, we can find a maximum load which will just be supported without breaking through the oil film at the point of smallest clearance. Taking the same conditions but putting the oil *supply* under pressure, we gain an effect equivalent to an increase in the strength of the oil film, allowing a higher load to be carried before breakdown in the film takes place.

There have been many learned works on lubrication and many long series of experiments, but these all serve only to give an indication of what may be going on in an automobile engine bearing. Nearly all the experiments have been made with large bearings running under constant loads, and the load in an automobile engine bearing varies constantly. Variations in cylinder pressure, coupled with the inertia effects of the reciprocating parts, cause perpetual variations in the oil film conditions. It is thought by most investigators

that this is of great assistance in maintaining the film. Suppose a load placed suddenly on the shaft, as by the explosion, it must take some fraction of a second to squeeze out the oil. By the end of this period the load is smaller or has changed its direction, thus offering relief to the oil film an instant before its fracture occurs, and the same thing is repeated throughout the whole cycle. Were it not for this, lubrication of a piston pin by splash would be utterly impossible. Here again the effect of having the oil under pressure can be seen, for it takes longer to squeeze out compressed oil than oil under little or no inherent pressure.

Another thing that is but little understood is the cooling effect of oil and its influence upon friction and the wear of bearings. In the sort of steadily loaded bearing with which experiments have been made there appears to be a definite oil temperature at which friction is lowest, but in these cases the only heat that reaches the bearing is the heat produced by friction. This is not true of an automobile engine, for this is kept hot and the 180 deg. or so in the water jacket is enough to maintain the crankshaft bearings at a fairly high temperature without the heat of friction.

Oil Cooled Bearings

Working on the assumption that lubrication will be assisted if the crankshaft is provided with more than ordinary methods for getting rid of its heat, A. P. Brush has devised his ingenious system of lubrication which uses the crankshaft itself as the main oil distributing channel. In this layout oil is pumped to an end bearing of the crank and led right through to the other end, small side holes giving the supply to the various other bearings. The idea is to pass through the crankshaft a much larger volume of oil than could be passed through the bearings.

No doubt in a splash system of oiling the oil which covers every portion of the inside of the crankcase carries off a good deal of heat as it drains back to the sump, thus using for cooling purposes more oil than passes the bearings, but there is one thing that must not be overlooked in considering the use of the oil as a cooling medium as well as for lubrication, and this is the ability of the oil in the sump to part with its heat to the atmosphere. The sum total in effect of supplying a bearing with a small quantity of cold oil might easily be the same as that of giving it an equivalent quantity of warm oil, using more warm oil to help cool it in other ways. If we assume that the oil, by some means, has to carry away so much heat from the bearings, we must provide the sump with means for transferring just that same quantity to the atmosphere.

Oil Radiators

In this connection it may be remarked that C. Y. Knight is reported to have wished, when designing the first Daimler engine, to pump the oil through external radiating tubes; possibly a few tubes in the water radiator could have been isolated for this purpose, but the Daimler Co. objected for fear it might be said that this was *necessary* with the Knight engine. In some racing cars oil radiators have been used most successfully, and in the short races at Brooklands a very usual trick was to have a big hand pump full of cold oil which could be shot into the crankcase about 150 yards from the finish, the result being a sensational jump in speed lasting just long enough to get over the line. This was in the early days and did not apply to modern machines with lubrication systems suitable for continued high speed work.

Another detail of lubrication which has had practically no attention is the grooving of bearings for obtaining the best distribution of oil. The few experiments made and reported go to show that most oil grooves do more harm than good. The reason for this is that the oil film is broken by the groove. Why this is can be realized when we remember that a groove connects different parts of a bearing and that the oil film pressures are different at different places. If

we link two spots together by a groove we cannot easily maintain different pressures at the two ends, since the groove acts like a passage external to the bearing.

In a splash system the oil groove ought to run lengthwise of the bearing so as to carry oil nearly the full length, and the groove should be located at the point of minimum oil pressure. Here it will not interfere with lubrication, since the pressure will be the same for the whole length. Diagonal grooves are disturbing to the equilibrium of the oil. But there is a difficulty here, this being that the point of minimum pressure on the circumference of the bearing is changing every instant as the direction of load changes. This means that a number of grooves linked together may be better than a single groove, despite their drawback.

Need Only Central Groove

With forced lubrication, however, grooves lengthwise of the bearing are seldom necessary, since automobile engine bearings are short for their diameter. Experiments made by R. K. Morcom, the head of the first manufacturing firm in Europe to build high speed steam engines in quantities, showed that the power absorbed by a bearing was reduced as the quantity of oil passing was increased. This probably is due to two things, to the cooling effect of the extra oil and to the fact that a big flow forced through means that the oil film is thicker and the danger of its breakdown less. The result of Morcom's researches showed that the best form of oil groove where lubrication is under pressure is a shallow groove right round the middle of the bushing with no longitudinal grooves. The theory of the effectiveness of this is that it forms a reservoir of oil under pressure, and thus insures a direct supply at whatever point on the circumference the minimum pressure due to the load may happen to be least at any instant. The plain circular groove, however, has one disadvantage, this being that it will, after a time, provoke the growth of a ring on the shaft. To overcome this Morcom staggered the upper and lower halves of the groove, this giving essentially the same effect as the plain groove so far as lubrication is concerned, but removing any danger of uneven wear on the shaft.

The results of Morcom's work were summed up in a paper read in England as long ago as 1910, and most of the curves shown here are taken from that paper. It is rather remarkable that nothing of the same character seems to have appeared since, for Morcom admitted that his research could be carried much further. For example, he stated that the flywheel end bearing in an automobile engine might need a lengthwise groove as well as the central ring, in order to permit enough oil to be passed through, but the exact location of such an additional groove and its proportional dimensions have, so far as the present writer is aware, never been studied completely. There is no data available on small bearings under alternating load with different groove proportions and fed with oil under different pressures, and there is an opportunity here for some engineer with a good laboratory to do some most valuable work.

Cylinder Oiling Separate Problem

Automobile engine lubrication has been complicated terribly as a problem by the need for using the same oiling system for the bearings and the cylinders. The effect of the smoke trouble and of carbonization has been to cause lubrication systems to be designed for the cylinders rather than for the bearings, and this has perhaps been a factor in restraining proper examination of the subject *from the bearing viewpoint*.

Ideally we should design our lubrication for the bearings and care for the cylinders afterwards, but the presence of too much oil in the cylinders seems so very difficult to prevent that engineers have perforce given most of their attention to what ought to be a subsidiary problem. Thus any investigations that may be made ought to be independent of

the cylinders, for what we want to know is the facts regarding bearing lubrication. Once having these we can proceed to devise means for caring for the pistons.

In discussion of an S. A. E. paper on a quite different subject, K. W. Zimmerschied questioned whether we might not some day come to thermostatic control of oil temperature. That we shall soon have an almost constant water temperature both winter and summer seems more than probable, so having thus removed one variable, it is not unlikely that Mr. Zimmerschied's suggestion for removing another may be followed out. If this is found possible in a commercial way it should be easy to discover by proper tests what pressure variations are desirable for the oil. Pressure, temperature

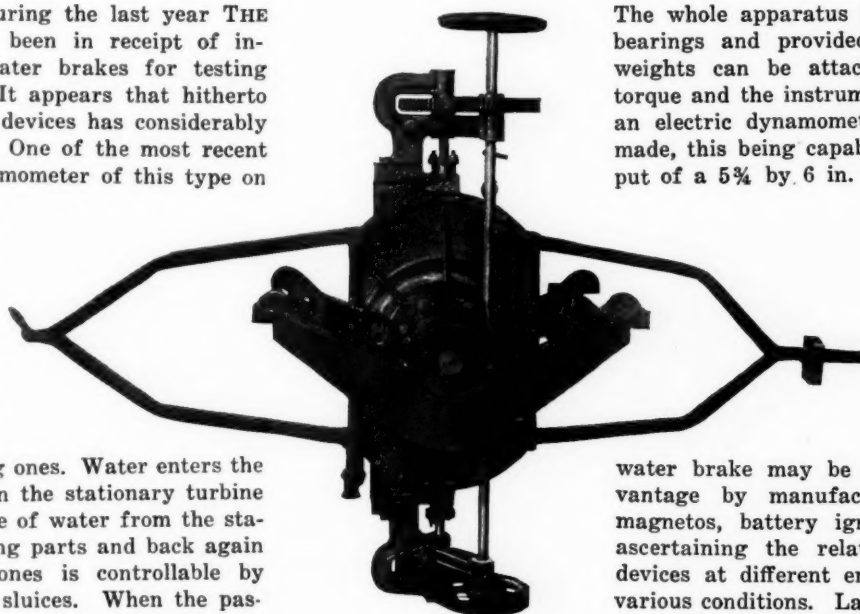
and load are all connected in some way. To get the lowest bearing friction they must all be proportioned.

If the subject of bearing lubrication, here briefly outlined, waits the attention of a scientific investigation, there are other factors which are purely mechanical and do not require the same sort of laboratory study. One is the relation between size of pump and of oil leads to provide a desired flow at a desired pressure, and the other is means for keeping oil away from the cylinders. Since these matters are separate altogether from the theory of bearing lubrication, they are better considered as an entirely different subject, and it is the writer's intention to attack this phase in a subsequent article.

Herschell-Spillman Co. Manufactures Water Brake

Brings Out Device for Testing Automobile Engines

SEVERAL times during the last year THE AUTOMOBILE has been in receipt of inquiries concerning water brakes for testing automobile engines. It appears that hitherto the demand for such devices has considerably exceeded the supply. One of the most recent firms to place a dynamometer of this type on the market is the Herschell - Spillman Co., North Tonawanda, N. Y., maker of the Herschell-Spillman engines. The instrument consists of a double rotating turbine with two stationary members and two revolving ones. Water enters the brake through holes in the stationary turbine blades and the passage of water from the stationary to the revolving parts and back again into the stationary ones is controllable by opening and shutting sluices. When the passages are wide open the load is at a maximum.



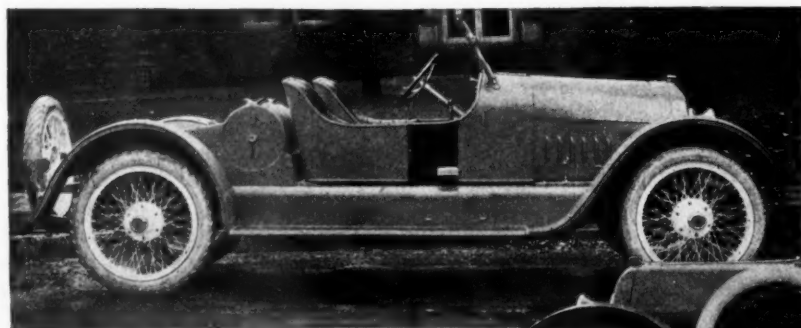
The whole apparatus is mounted upon roller bearings and provided with arms to which weights can be attached in measuring the torque and the instrument is used exactly like an electric dynamometer. One size is being made, this being capable of handling the output of a 5 1/4 by 6 in. six-cylinder engine. It

weighs 350 lb. and measures 8 ft., 2 in. from tip to tip of the two arms, as shown in the accompanying illustration.

Besides being useful for testing automobile engines, the Herschell - Spillman

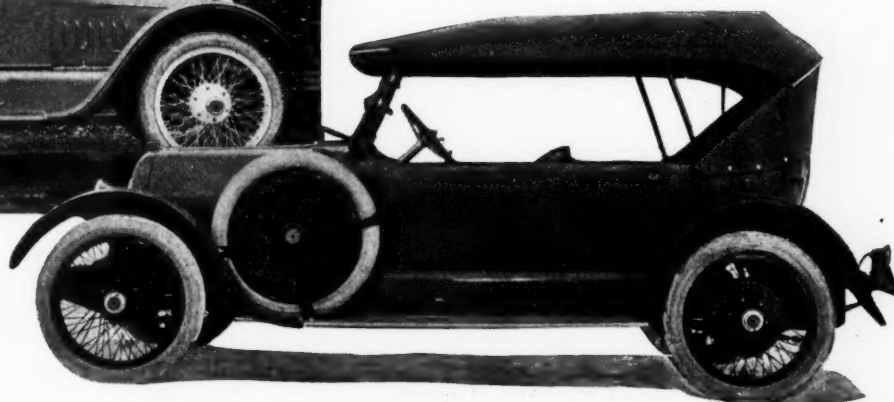
water brake may be employed to great advantage by manufacturers of carbureters, magnetos, battery ignition systems, etc., in ascertaining the relative efficiency of their devices at different engine speeds and under various conditions. Large service stations and repair shops, will also find it useful.

Two New Models on Daniels Eight Chassis



Above is the new speedster model mounted on the eight-cylinder Daniels chassis. The slanting windshield, sloping rear deck and spare tire carried at the rear aid in creating an impression of racy lines. Note step beside buffer

Below is the four-passenger Daniels eight-cylinder model which has an aisle between the front seats. Note the unusual lines of the top which has a rounded effect at the rear, and also the large overhang of the fenders

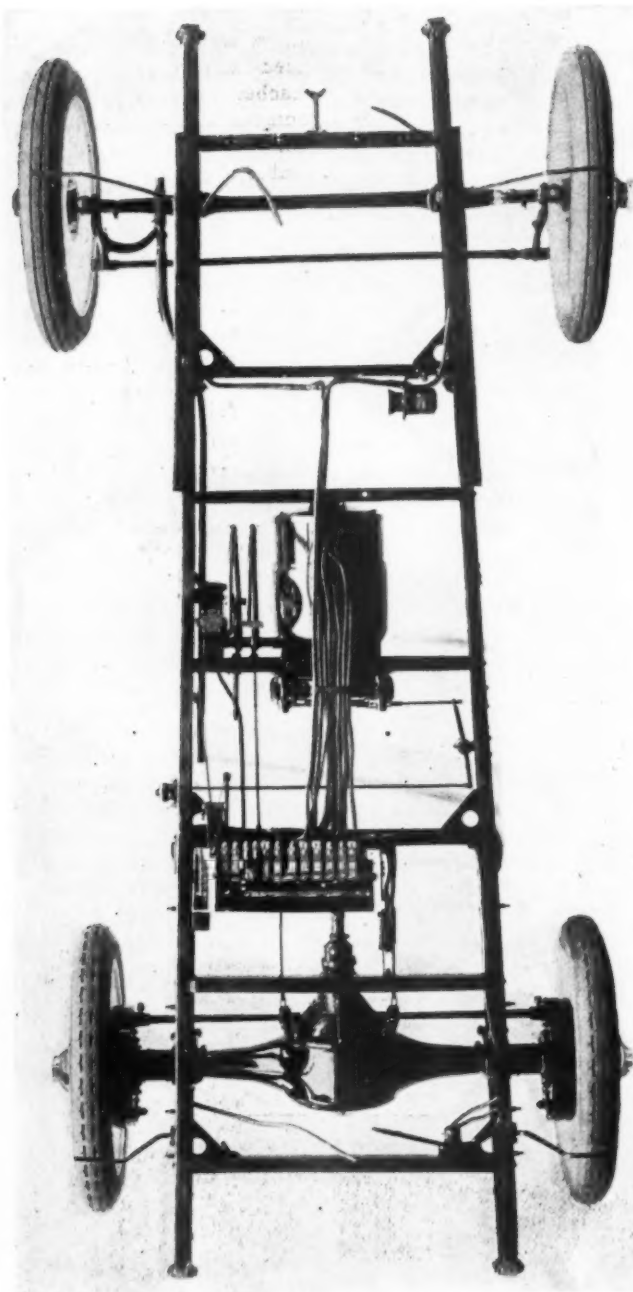


Standardization in Detroit Electric

Car Lightened, Tire Size Reduced, and Spring Suspension is Changed to Semi-Elliptic



Model 68 Detroit Electric brougham selling for \$1,775



Plan view of the chassis illustrating the motor mounting, controller set and layout of wiring

STANDARDIZATION and all that quantity production infers have resulted in a reduction of \$1,100 in 2 years in the price of Detroit Electrics made by the Anderson Electric Car Co., Detroit, Mich. The cuts last year were from \$600 to \$725 below the former cost, and this year \$500 additional has been taken off the selling price without lowering the quality of the product, but simply by applying the rules of scientific manufacture on a quantity basis.

The reduction in price has been made possible by increasing largely the supply of up-to-date automatic and semi-automatic machinery, by using the chain method of production and by standardizing the product through the elimination of a wide variety of options in color, upholstery, finish, etc. The only changes in the specifications outside of the fewer options are a reduction in tire size from 34 by 4½ to 33 by 4½, a change in the spring suspension from elliptic rear to semi-elliptic all around and a reduction in the size of brakes and some of the dimensions due to the elimination of considerable overweight in the construction of the body. In spite of the great reduction in price this year, from \$2,275 to \$1,775, there was no apparent difference in the exterior of the cars with the exception that the side lamps are eliminated on the new model and the running lights incorporated in the head lamps.

Two Chassis Models

The more expensive chassis is continued, thereby giving the Anderson company two chassis models in place of one last year. The leader, however, will be the new model which is known as 68 and which is the product that is being put out on a quantity basis.

One of the important changes which has lowered the price of the car and has made it lighter, giving a considerable advantage in mileage rating, is the use of leather roof in place of the sheet aluminum. Weight has also been saved by the use of Hotchkiss drive, in the semi-elliptic spring and in the smaller wheels which have, however, the same section diameter of tire. The difference of weight is reflected in the smaller battery which is a forty-two-cell, thirteen-plate in place of a forty-two-cell, fifteen-plate which gives the same mileage as in the more expensive model. Some of the details on the new body are weight savers also, as they are in the line of greater simplicity. A good example of this is in the rear corners of the body which were formerly equipped with windows, while in the model 68 these are not installed.

Pressed Steel Used

Pressed steel is used in the structural work on the model 68 chassis, all the assembling being done in the Anderson factory. The cross members, brackets, and gusset plates are hot-riveted with automatic hammers to the side frame members. The cross members are designed to carry the electric

motor and the driving units which are assembled upon it. The motor is bolted to the frame in the center and the battery equipment is equally divided. Twenty-one cells of this are in front and twenty-one in the rear, giving a balanced car with the weight on the front and rear axles approximately equal.

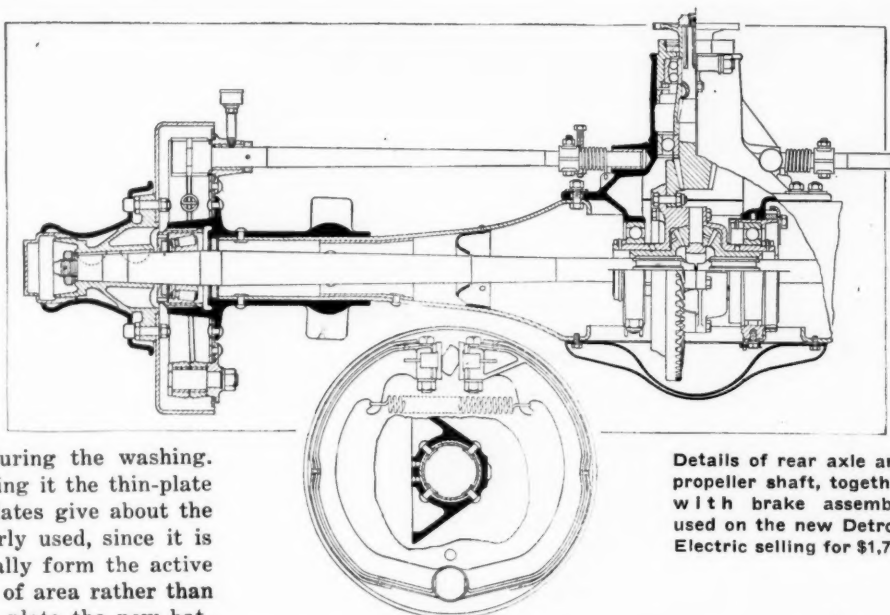
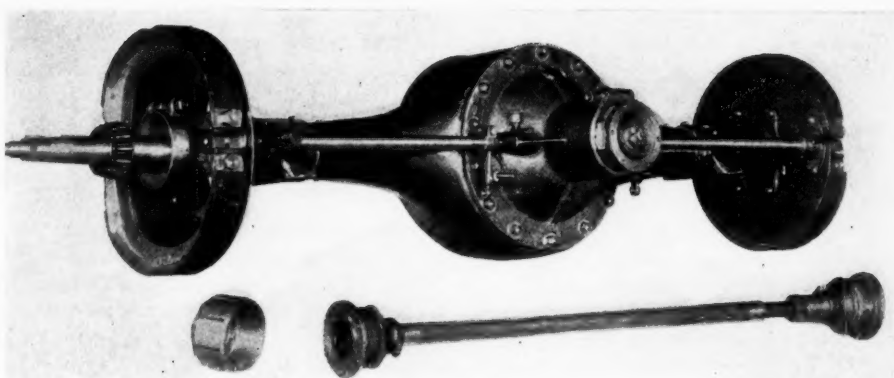
Wiring on Chassis

One of the assembly features of note is that all the wiring is made up in a standard form before it is assembled to the chassis by special cleats. The entire wiring with the exception of the body lights is carried on the chassis.

Timken bearings are used in the wheels with ball bearings for the steering parts and at the knuckles. The friction points in the majority of instances are equipped with self-lubricating bushings and the others with grease and oil cups accessibly located. The standard tire equipment is the Goodrich Silvertown cord.

High-ribbed jars are used in the new Detroit Electric batteries. These ribs are sufficiently high to hold all the active material which will come off the plates during their normal life, thus making a non-wash battery, or one that does not require washing. The purpose of this is to give the user more total life, as some of the active material is always lost during the washing.

Weight is saved in the battery by making it the thin-plate type. It has been found that the thin plates give about the same capacity as the thick plates formerly used, since it is only the surfaces of the plates which really form the active working parts and capacity is a question of area rather than plate volume. With the less weight per plate the new battery has a greater capacity per pound than was possible with the old construction. More plates can be placed in each jar, thus reducing the current used per plate and adding to the



Details of rear axle and propeller shaft, together with brake assembly used on the new Detroit Electric selling for \$1,775

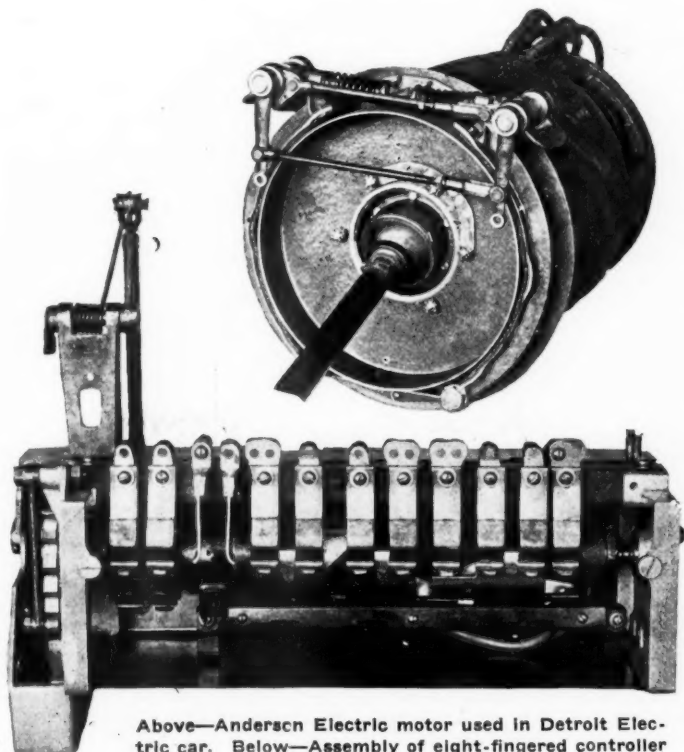
life of the battery. The Anderson company now guarantees a battery for 8000 miles or 2 years normal service. The capacity of the Model 68 with thirteen plates, six positive and seven negative, is 150 amp. hr. The battery is located under the hoods, front and rear, so that it is easily accessible for filling, etc. It can be removed by loosening the hold-down bolts.

A series-wound motor of slow speed characteristics is used on Model 68. The feature of a series motor is that the torque increases with the load, and the electric car is thus enabled to increase its output to accommodate adverse road conditions. By using the slow speed motor, reduction gears have been eliminated with a saving of weight and an increase in transmission efficiency.

Motor 90 Per Cent Efficient

Hess-Bright bearings are used for the armature and as these are packed in grease they require minimum attention. There are four sets of carbon brushes distributed on a commutator of large area giving a high current carrying capacity. The efficiency of the motor is said by the Anderson engineers to be 90 per cent at normal running speed, this efficiency being obtained by using a large amount of copper.

Five speeds forward are supplied by the drum type of controller. This is a finger-and-blade design of large size to carry the heavy current resulting from overloads. As an additional safety precaution there is a self-lubricating felt oiler which rubs against the contacts on the controller, keeping them continually lubricated. Refinement of design has cut the number of fingers on the controller to eight, and this, together with the fact that the reverse switch and cut-out switch are both mounted in the same housing as the con-



Above—Anderson Electric motor used in Detroit Electric car. Below—Assembly of eight-fingered controller

troller, has added simplicity and reduced weight. The controller is assembled underneath the rear seat and is covered by a dust-proof housing.

For the main circuits No. 1 wires are used and all the leads are short, as the motor, controller, cut-out and reverse switch are close together. In assembling the wires taper terminals are used sweated to the wires. These terminals fit into taper sockets and are screw-fastened.

Direct drive through a short propeller shaft with two universals transmits the power to the three-quarter floating axle, the drive being through spiral bevel gears. Two separate sets of brakes are provided, those on the rear hubs being internal expanding, 16 by 2½ in., and these are operated by pedal. To the left of the brake pedal is a small pedal, pressure on which locks the hub brakes and automatically cuts off the power. This is for use when parking the car. The second brake operates on the motor and is applied by a slight backward movement of the control lever so that the motion for shutting off the power and applying the brakes is continuous.

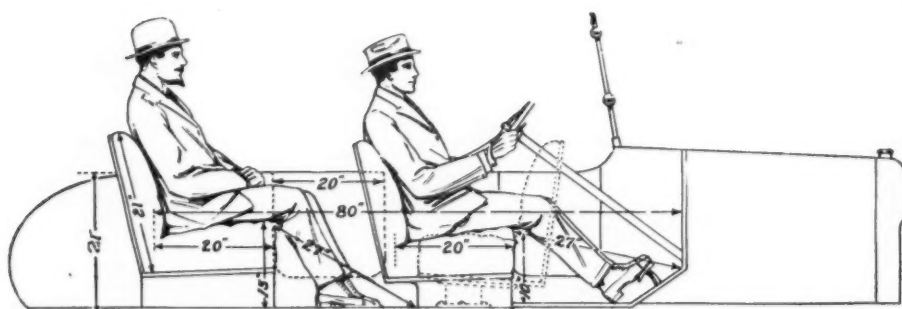
In controlling the car, the operating levers are mounted at the side of the rear seat, in parallel position, one above the other. The longer lever is operated by the right hand and is for steering the car. The shorter lever controls the

speed. When the driver leaves the car these levers may be turned up out of the way and locked, preventing theft. Speeds of from 6 to 25 m.p.h. are available, and the mileage per charge is between 75 and 100.

In finish and equipment, the electric brougham affords a vehicle of fine appearance. The fenders are pressed steel, oval-crowned designed and are skirted to the body, protecting it against mud. The standard painting is cobalt blue with white stripes. The wheels are painted in white, cream, red or blue, as specified. The upholstery offers a selection of three designs of whip-cord. It is Turkish type with deep cushions padded with curled hair. With the 100-in. wheelbase chassis a capacity of four passengers is provided.

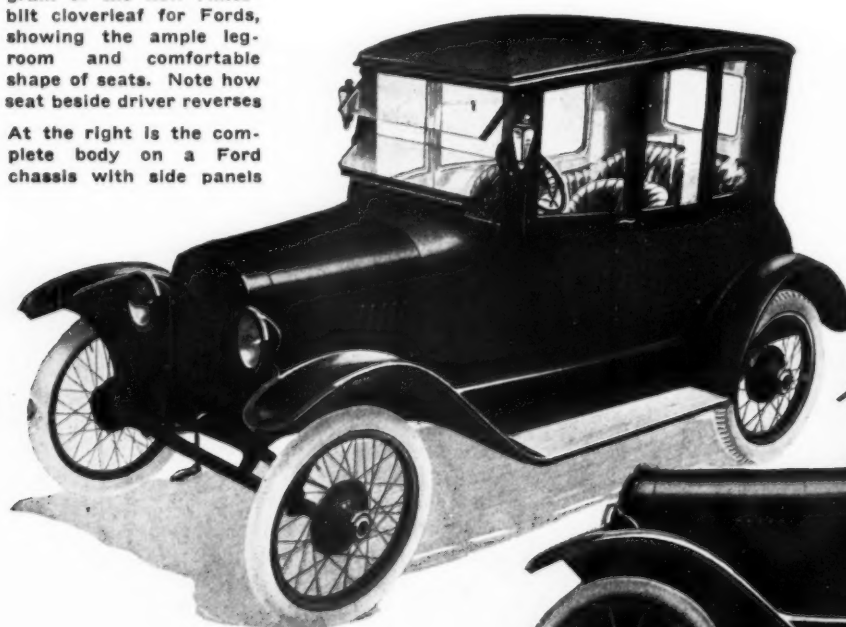
Body features have always been carefully looked after in electrics and the new Detroit incorporates a number of comfort features. There is an upholstered package box in the left front corner which may also be used as a passenger seat. In summer weather the windows may be lowered by a patent device; and the door windows are sashless and are operated by a lever from the inside. The seat widths are generous, the rear seat being 49 in. with 18 in. depth, the door opening 24 in., and the distance from the front to the rear window, 63½ in. Houk wire wheels are furnished exclusively on this model.

Amesbilt All-Season Cloverleaf for Fords

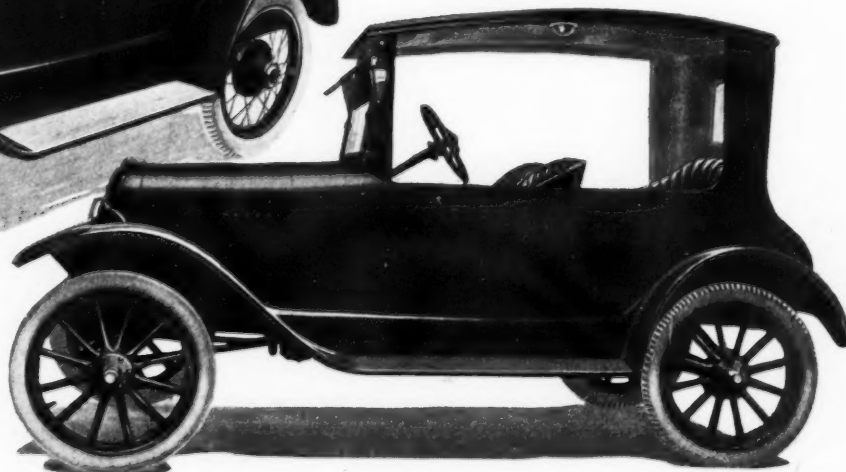


Above is a seating diagram of the new Amesbilt cloverleaf for Fords, showing the ample leg-room and comfortable shape of seats. Note how seat beside driver reverses

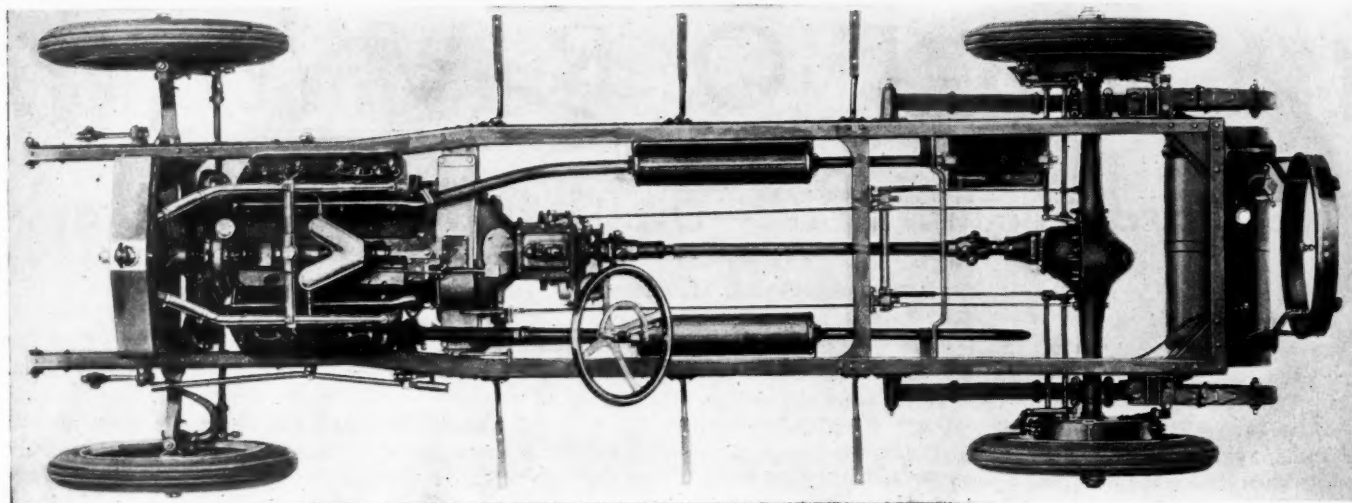
At the right is the complete body on a Ford chassis with side panels



At the right is the Amesbilt cloverleaf with side panels removed for warm weather driving. Note straight lines of body and dome light in top



DESIGNED to render possible mounting an up-to-date streamline four-passenger all-season cloverleaf body on a Ford chassis, the Amesbilt construction illustrated herewith has been brought out by the F. A. Ames Co., Owensboro, Ky. As shown in the diagram, measurements have been arranged to provide ample leg-room and comfortable seating, the seat beside the driver being reversible without sacrificing rigidity. Top and side panels are removable but are securely fastened so that rattling is prevented. A special streamline hood and radiator shell for 1917 Fords is furnished, with other designs for previous models. Windows are plate and are watertight and noiseless, the upper part in the doors lowering into a felt channel. Skirts on fenders and body make inclosure complete, including front and rear. Upholstery is in cloth, whip-cord or leather. Electric side lights are standard, with colonial lamps for \$10 extra. The body lists at \$325.



Chassis of the Murray eight, showing the mounting of the unit power plant, position of storage battery, rear fuel tank and tire carrier and the layout of the double exhaust line

Murray Eight Has Custom Style

Standard Units Used in Substantial Chassis—Appearance Is Distinctive—Equipment Is Very Thorough

THE avowed aim of the Murray Motor Car Co., Pittsburgh, Pa., in designing the Murray eight has been to produce a car of broadly conventional design but with a distinctiveness of appearance and a general soundness of construction in excess of the normal. It is a powerful car and everything about it is after the custom-built style, the equipment being exceptionally thorough, and the price of \$2,500 includes the option of finish in any color.

The power plant consists of a Herschell-Spillman engine,

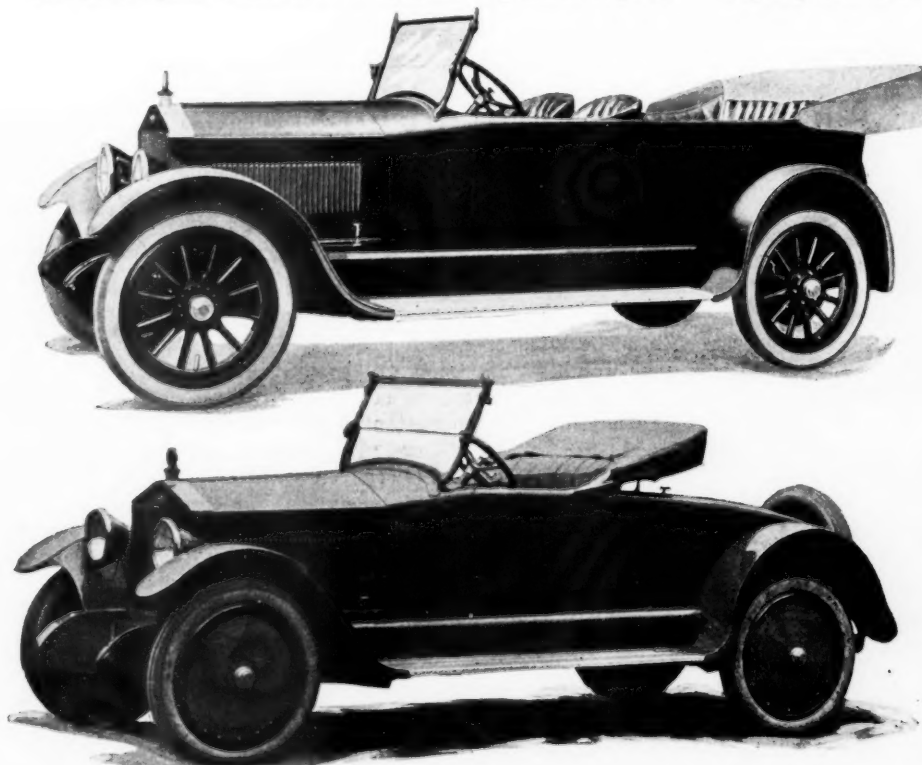
3¼ by 5 in., which is claimed to have a b. hp. of 75, and a Covert three-speed gearset, the clutch being a Borg & Beck dry disk. The axles are both Timken, the floating pattern being used at the rear, and Hotchkiss drive is used, the rear springs being three-quarter elliptic. The electrical units include Westinghouse generator and starting motor with 100 amp.-hr. battery and ignition is furnished by a Dixie magneto.

Rigidity has been aimed at in designing the frame, which is of deep section, and it is dropped a little to give a low body position. The wheelbase of the chassis is 128 in. and 34 by 4½-in. Goodrich Silvertown cord tires are fitted as standard equipment. The smaller details of the chassis equipment include a Zenith duplex carbureter with a Stewart vacuum feed from a tank at the rear end of the chassis. The general equipment comprises every minor detail as well as such important features as an electric clock, a power tire pump, Hartford shock absorbers and a Boyce Moto-Meter.

Chassis Price \$2,000

The chassis can be obtained without body for \$2,000 and any sort of body is provided that may be called for, the illustrations showing a touring and a roadster obtainable for the \$2,500 figure. It will be observed that the general scheme of the hood and body gives a European effect, making the car instantly recognizable.

Wheels are wood, of the artillery type, with the front wheels cambered, this constituting standard equipment, although wheels of other styles may be fitted.



Two body styles obtainable on the Murray eight-cylinder chassis for \$2,500. The European influence is evident throughout the general design of both cars



The F O R V M



Criticizes Vacuum Brake—Overlooks Important Feature

By H. M. Brayton

AS a student of mechanical engineering, I wish to submit the following criticism based on the article which appeared in THE AUTOMOBILE for Nov. 2, 1916, on the design of a vacuum brake for automobiles by the Prest-O-Lite Co. of Indianapolis, Ind.

The vacuum brakes designed by the Prest-O-Lite Co. seem to be inadequate to meet all the requirements demanded of a power brake for this class of work. Foremost among the faults of this apparatus is the fact that the brake is of absolutely no value unless the engine is running. It very often happens that the automobilist in descending a long grade, wishes to save fuel by allowing his engine to stop entirely. He could not do this unless his car was equipped with another brake and unless this vacuum brake will in itself cover all needs its field of usefulness must be very greatly reduced.

In heavy traffic where the surroundings are noisy it often happens that the engine will stop when the clutch is released and the driver be unaware of it. The brake would again fail with good chances for a smash-up and damages.

In the article mention is made that a difference of pressure of 10 lb. is available from the suction. I wish to show that in the average car with a volume ratio of 3 to 1 we have, assuming Boyle's law to hold and an isothermal suction, that

$$P^2 = \frac{PV}{V^2} = \frac{14.7 \times 1}{3} = 4.9 \text{ lb. absolute}$$

when P and V are the pressure and volume respectively, at the beginning of the suction stroke and P^2 , V^2 the same quan-

ties at the end of the suction stroke. This shows that the theoretical limit with this volume ratio is $14.7 - 4.9 = 9.8$ lb. difference of pressure available for the brake.

It is a well-known fact that gas engines nearly always exhaust above atmospheric pressure, and so it seems unlikely that the theoretical limit could be reached in practice. However, the lower pressure could readily be multiplied by leverage.

A cylinder 7 in. in diameter seems rather crude and takes up altogether too much space with this size, and a stroke of 4 in., the volume of which must be reduced in pressure before the full force can be exerted on the brake is very large and an appreciable time would be required.

The control valve is indeed an ingenious mechanism, and if the suction were only more reliable this brake would have a wide field of usefulness, especially in heavy work such as heavy touring cars and trucks.

EDITOR'S NOTE—Mr. Brayton appears to have overlooked the fact that this brake must operate as long as the gear is engaged and the car moving. When coasting with the clutch out if the engine stopped it would only be necessary to let in the clutch to obtain suction immediately.

Regarding the pressure available, running with the throttle shut in the idle position the pressure in the cylinder at the end of the exhaust stroke would not be above atmospheric. As to the size of the cylinder, this is by no means so large as a muffler and on most chassis there is plenty of room for it, since it can be mounted almost anywhere.

Melting Scrap Aluminum a Difficult Operation

THE melting of aluminum scrap, particularly chips from machine shops, might, to the uninitiated, appear a very simple process. How difficult it is to perform without excessive loss through oxidation is, however, made abundantly clear by Bulletin 108 recently issued by the Bureau of Mines. This bulletin has eighty-eight pages devoted entirely to this matter. The book is very interesting reading even to an engineer not too closely acquainted with foundry practice and in it, in addition to much very valuable information, there are some interesting figures regarding the quantity of aluminum absorbed by the automobile industry. It is stated that a conservative estimate of the amount of aluminum employed in automobile manufacture in the United States from July 1, 1914, to June 30, 1916, was 50,000,000 lb.

The percentage machined off from a rough aluminum casting in the finishing process seems, from data obtained by the writer, to average about 15 per cent, a figure which is much higher than was estimated offhand by several people connected with the automobile and aluminum casting industries, whose guesses averaged 3 to 4 per cent. The writer's result was reached by weighing rough and finished castings at an automobile plant making a car in the \$700 to \$800 class, and by weighing rough and finished castings made for various other motor car manufacturers at an aluminum foundry, with the results shown in the accompanying table.

The results of the tabulation, which indicate that 15 per cent was machined off, were so at variance with the estimates cited that the matter was taken up with the makers of a car in the \$2,000 class, who state that on that car there are used forty-seven aluminum parts which are machined, the total weight of the rough castings used per car being 166.19 lb. The loss per car in chips is 25.15 lb., or 15.1 per cent. The weights were taken on the average of a number of like parts, in some cases as many as fifty being weighed. On the basis of 15 per cent of metal machined off, the yearly production of chips from aluminum castings in the United States will then run between 3,000,000 and 3,750,000 lb. If 20 to 30 per cent of this amount is unnecessarily lost, then 600,000 to 1,125,000 lb. of aluminum alloys worth 16 to 25 cents per pound, based on the average market quotations in normal times, is lost.

PROPORTION OF METAL MACHINED-OFF ALUMINUM CASTINGS

Casting	Weight of Rough Casting, Pounds	Weight of Finished Casting, Pounds	Percentage of metal machined off, Per Cent
Gear and transmission case.....	28.50	24.50	14
Small double-flanged exhaust elbows..	.42	.35	15
Intake pipe for six-cylinder motor.....	5.00	4.80	4
Gear case for small motor.....	8.90	7.00	21
Gear case for very small motor.....	1.58	1.50	5
Crankcase for eight-cylinder motor....	94.00	80.00	14.5

Self-Oiling Bushing's Many Uses

Automobile Industry Will Employ 5,000,000 During 1917

PROBABLY few people are aware that the impregnated self-lubricating bearings which are now used so extensively for light duty parts in automobiles are quite an old idea. Probably it is also seldom realized what a very large quantity of such bearings are now being used by the automobile industry. The Bound Brook Oil-Less Bearing Co., Bound Brook, N. J., will supply nearly 5,000,000 bearings of this sort solely for use on automobiles and trucks during 1917, this figure including the outputs of both bronze bushings with a special form of graphite insertion and wood bushings which are impregnated with graphite.

The original Bound Brook bearing was designed for use on electric trolley wheels, where the difficulty of lubrication was a serious trouble. The first batch of bronze bushings with graphite insertion was supplied for this purpose in 1889 and the output of trolley bushings alone is now in excess of a million a year.

Broadly speaking, the oilless bearing is valuable for two different classes of service. For parts with only occasional small motion, such as for the mounting of brake shafts, etc., a graphite insertion keeps the surfaces in good condition and provides all the lubrication necessary, continuing to do this for a very long time. It is even inadvisable to oil them be-

cause oil attracts dust, which it may transfer to the rubbing surfaces, while the graphite has no such tendency.

The other sphere of usefulness is in cases where a moderately light duty bearing will normally have a supply of oil, but may be allowed to run dry. A prominent example of this sort of application is the spindle of a starting motor. This is supposed to be lubricated but is often neglected. To use ball or roller bearings would be needlessly extravagant for a part of which only runs for such very brief periods. A Bound Brook bearing can be neglected even more carelessly than a ball bearing, because the latter requires to be protected from damp which would not injure the impregnated bushing.

Quite a different part which it is difficult to supply with oil or grease successfully is the thrust collar used for throwing out the clutch. Here again, we have an example of occasional use and the graphite inserted in the bronze is able to care for the lubrication unaided. Steering gears, pump shafts and many other applications will suggest themselves, and the illustrations give an idea of the many types of bushings made for automobile applications.

The wood bushing which is impregnated right through has a sphere of usefulness distinct from the bronze bushing with graphite insertion. Naturally the wood will not stand up



Bound Brook phosphor bronze self-lubricating bushings and clutch forks; the six pieces on the right are Nigrum wood bushings

under the same pressure per square inch that can be supported by the bronze, but wherever sufficient area is obtainable it can be employed because it may be oiled without producing any distortion. This probably is because the pores of the wood are completely filled during the impregnation, the bearings being finish-machined after that process.

Experiments in shackle pin bushing have shown that the wood is a much better material than the bronze, provided the spring eye is large enough to admit a bushing of such size that it will be certain not to split. Where movement is oscillatory and only over a very small angle, the graphite in the bronze bushings does not seem to spread very effectively; there should be a movement of something like 30 deg. to keep the bronze bushing in the best condition, but the wood bushing is not limited in this respect.

It is also highly probable that many uses will be found for Nigrum material, as this impregnated wood is called, in forms other than that of a cylindrical bushing; as an example experiments are being made with slip blocks on textile machines. The impregnated wood can be cut into any shape and the machining is cheap.

The process of manufacture of both the bronze and wood bushings is very simple. The wood is brought roughly to size and is then soaked in a solution containing graphite, after which it is subjected to a secret process, where fairly high temperature and pressure are applied simultaneously. After this treatment the parts are finish-machined and require nothing further done to them. The wood used is ironwood, this having proved the hardest wood that can be impregnated with certainty.

In making the bronze bushes, the grooves which are afterward filled with the graphite compound are cast, since some "tooth" is needed to hold the compound during manufacture. The bushes are finished completely before they are loaded, and to load them the bush is filled with a pasty mixture of graphite and a plunger is then driven through, forcing out the excess and ramming the groove. After this follows subsection to pressure and temperature, the details of which process are jealously guarded, this being followed by baking in ovens. The final process is to push through a plunger which removes any surplus lubricating compound and still further consolidates what is in the grooves.

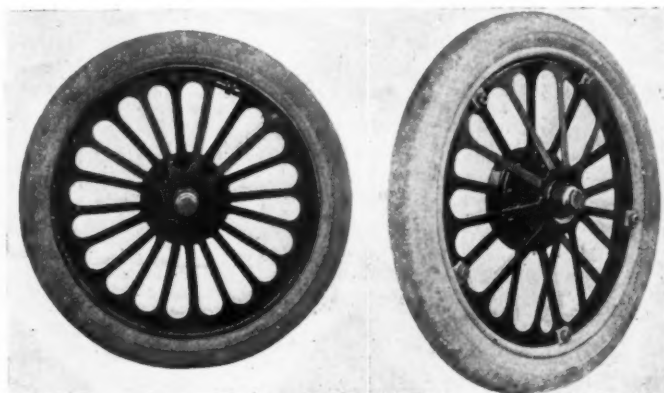
Baker Steel Wheel Has Tension Spokes

INVENTORS of steel wheels are aiming at cheap production, good appearance, strength and convenience. The new Baker steel wheel seems one of the happiest combinations of all four qualities.

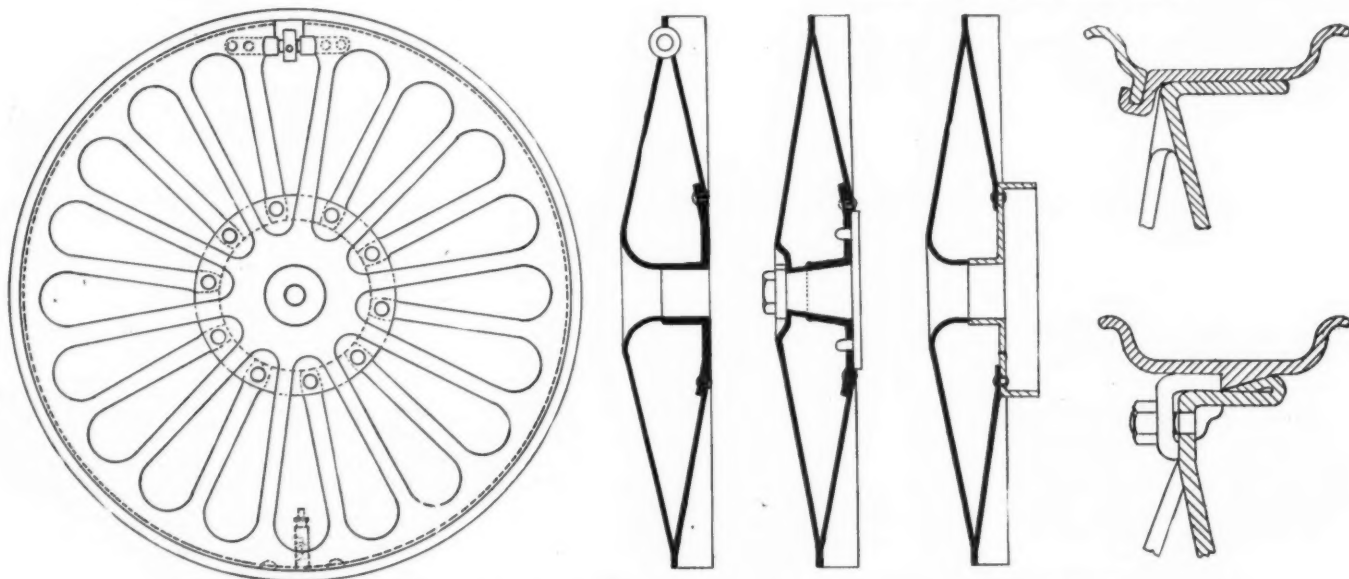
The raw material consists of a disk of thin sheet steel. The first operation is to punch out a number of pieces, so as to leave a set of spokes, joining the rim to the center. Then every alternate spoke is cut off at its inner end where it joins the center piece. This gives two sets of spokes, one set joined together at both ends, and one set with the inner ends free. The second set are then bent sideways and their ends riveted to a steel stamping consisting of a disk with a hub piece pressed out from it, the "hub" being welded or otherwise secured to the center of the original disk; and thus we have a complete wheel needing only the attachment of the rim. Any form of demountable rim can be used and any kind of hub design.

A special rim has been designed for this wheel, this being cut through at a point opposite the valve hole, and a turn-buckle used for contracting it, this being the only part that has to be unscrewed for detaching the rim; there are, of course, some studs or dowels to take the drive.

Plans are well advanced for the manufacture of the wheel on a large scale, both for passenger cars and trucks. The inventor is E. K. Baker, of demountable rim fame, and the patents are held by a new corporation, the Baker Wheel and Rim Co., Chicago.



Examples of finished Baker wheels



Sketches showing the construction of the Baker steel wheel and a few variations upon the basic idea of the device

Lower Fuel Is Greatest Carbureter Problem

Increased Heat, Better Atomization and Higher Jet Velocities the Remedies—Few New Models But Many Refinements

By J. Edward Schipper

ONE consideration, the descending grade of fuel, stands out so prominently as an influence of carbureter design for 1917, that everything else is insignificant by comparison. Mechanically, every manufacturer of carbureters has a different solution for the problem. From an engineering standpoint, however, there are just three classifications of the methods used to meet the issue. These are, in the order of importance, heat, atomization and velocity. The latter two are correlated to a certain extent, but as will be seen by a study of the different types, there is a distinction.

There is a great amount of uncertainty, and has been for some time, regarding the matter of where the carbureter manufacturer ends and the car manufacturer begins in meeting the requirements of the heavy fuel. There is no doubt but that the problems of carburetion and intake manifold design are bound closely together. In fact, the best carbureter made will show poor results on an engine with an improper manifold. Hence the improvements which have been made by the engine and car designers in this respect have advanced the art of carburetion in its broad sense.

No Change in Fundamentals

A year ago, in its review of the subject of carburetion, THE AUTOMOBILE gave a complete classification of the types of carbureters used on American cars. The elapsed period has seen no change in these fundamentals; they remain the same, and yet it can be said that the art of carburetion has gone forward in the past year because the instrument is now coping with conditions which are far more difficult than they were then. The improvements are largely in detail. The details of manifold design, and of carbureter arrangement which have been improved all line themselves under one of the methods of betterment mentioned above; heat, atomization or velocity.

Manufacturers of cars demand from the carbureter manufacturer what the public demands of them. They are asking, in spite of the heavier fuel, for more acceleration, better and quicker starting on frosty mornings, better low-speed, high-gear performance, greater economy, lower idling speed, better hill climbing ability—that is, increased torque

or crank effort at slow speeds with wide open throttle. In fact, everything that goes to make up good car performance is being demanded more vigorously every year by the car-buying public in every grade of car.

Classifying the Carbureters

The manner in which the desired result is attained forms the basic classification of the carbureter. This is really the starting point in carbureter design. The higher speeds, where the energy is at hand, are simple compared to providing an accurate, well broken up mixture at the lower end of the speed range. At the same time, this main jet, or primary device, which supplies the engine at low speeds, must play its part in the wider throttle openings. The ways in which this compensation is made have been classified as follows:

The air valve type, where compensation is made by the opening of an air valve.

The metering pin type, where compensation is made by raising and lowering a measuring pin which governs the jet size.

The expanding type, where the number of jets in action corresponds to the throttle opening.

The compensating jet type, where an auxiliary jet comes into action at wider throttle openings.

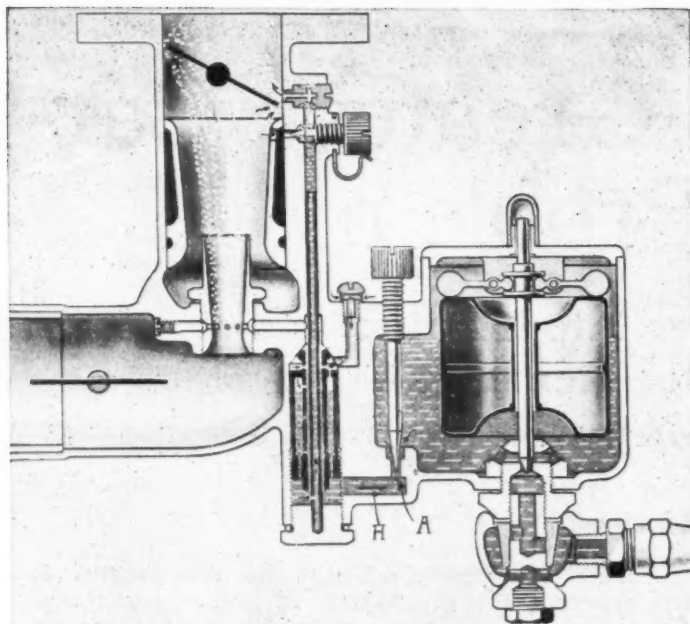
Besides these there are miscellaneous special divisions. As carbureters are classified according to these divisions, the well-known makes would be arranged under the heads in the accompanying table.

It will be noted that some makes, such as Stromberg and Rayfield, fall under different heads. This is because they do not purely belong to one class, but employ principles and are of such construction that they fall under more than one head.

This year engines are returning more for a unit of weight and for a unit of displacement than ever before. The carbureter manufacturer is playing an important part in this. The same elements that go to make for economy in carburetion go largely to make good rated performance in an engine. The manner in which carbureters generally have been improved in the lines mentioned differs according to the basis type of the carbureters. What representative makers have

Carbureters Classified

AIR VALVE	Heath	Bail & Ball
Air Friction	Newcomb	Tillotson
Breeze	Rayfield	Flechter
Zephyr	Tom Thumb	Sunderman
Shain	H & N	
K-D	Webber	EXPANDING
Browne	COMPENSATING JET	Master
Branford		Carter
Stromberg	Zenith	Juhasz
Ensign	Holley	MISCELLANEOUS
METERING-PIN	Stromberg	Stromberg
Schebler	Longuemare	Rayfield
Stewart	Johnson	Kingston
	Marvel	



In the new Stromberg model L a little mixture flows directly into the manifold above the throttle for starting and providing a good mixture when throttle is practically closed. A is the gasoline feed adjustment and H is the passage to the acceleration well through which the fuel passes from the float chamber

done forms an interesting study, the developments of each being taken up in detail on pages 1022 to 1031.

Stromberg Has a New Design

Stromberg has added an entire new carburetor to its line to take care of the dual problems set up by the higher demands and the lower fuel. In this new plain tube carburetor the general heads under which the improvements are found are atomization and velocity. The atomization is secured by introducing air into the fuel jet so that when it is drawn out it comes out not as raw fuel but as a partially mixed super-saturated vapor, which combines readily with the main flow of air.

The increased-velocity method is used particularly for high accelerative qualities and is used in connection with an acceleration well. When the carburetor is set for ordinary speeds at economy, as a general rule the flexibility has to be sacrificed to some extent. To overcome that the new Stromberg is so arranged that an extra supply of gasoline and air is supplied for acceleration when it is needed. The well fills with gasoline when idling or upon increased suction due to throttle opening, and in answer to the throttle demand this gasoline is drawn at high velocity into the main jet.

New Holley Uses Acceleration Well

A good example of the acceleration well is given in the new Holley. Under ordinary running conditions the well is dry. The well is formed by a bowl-shaped depression below a standpipe through which the mixture is drawn at high velocity. The air enters the standpipe through the bowl-shaped well space and the nearer empty it is the more air in proportion to the gasoline will enter, thus giving the compensation required.

These two makers, Stromberg and Holley, represent the only two who have so far carburetors of new type, and both have retained the funda-

mental features of their own designs. In practically every other case, the changes may be called refinements of existing types rather than alterations or additions of new principles.

Taking up the matter of acceleration, Schebler will soon be out with a new type, with low-grade fuel, which is one that is uppermost in the minds of carburetor and car makers alike. It will be worth while to note that in both the cases mentioned where marked changes have been made to attain higher acceleration, the acceleration well has been employed where the little supply of gasoline is held always ready to meet the requirements of the engine in picking up.

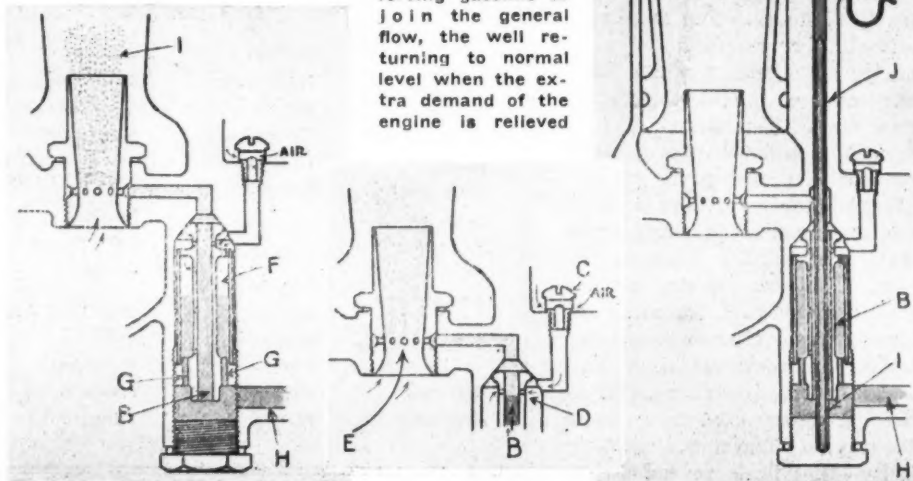
Full Hot Air Another Improvement

The use of full hot air rather than semi-heated air is another of the changes which are of use in increasing the accelerative qualities. The Master carburetor is an example in which full heated air is now employed instead of semi-heated, that is with primary air hot and auxiliary cold.

Another distinctive carburetor which should be mentioned in connection with improved acceleration devices is the Ball & Ball made by the Penberthy Injector Co. For easy starting and for acceleration there is a passage from the float bowl to a point above the throttle. This passage contains a plunger and when the vacuum increases it rises and shuts off the flow of gasoline from the intake passage. As the throttle is opened the vacuum in the intake passage is broken and the plunger drops, causing gasoline to gather above it. This is immediately drawn through the passage, giving the extra supply for acceleration.

The above examples are some of the special means taken to increase the accelerative qualities of the carburetors. It requires an additional flow and this must be instantly available or the carburetor will choke and sputter, before picking up its work. In the compensating jet type of carburetor this supply is given by jets uncovered by the opening of the throttle or which are brought into action in some other way by increasing the throttle opening. Carburetors such as the Master, in which the wider open the throttle is the more jets are uncovered, the Johnson, in which the suction raises a sleeve that covers the jet openings, and the Zenith, with a secondary jet surrounding the main jet, are all examples where the compensating jet takes care of acceleration. On the Zenith there is also a well, but this is used to supply

In the Stromberg L air enters at E, and through C and B, carrying fuel which is sprayed into the main channel. An accelerating well F concentric with passage B is filled with fuel. At speed air is drawn through C, forcing gasoline to join the general flow, the well returning to normal level when the extra demand of the engine is relieved



the secondary jet and is not open like that of the Marvel, Stromberg and Holley types.

Securing Easy Starting

The problems of acceleration and easy starting are somewhat allied, but differ in one material respect, and that is in the amount of throttle opening. When starting the throttle is nearly closed, when accelerating it is wide open. In both cases, however, a quick supply of gasoline is required, with a mixture richer than in ordinary running. For this reason on some of the carbureters the same device that acts for easy starting also helps in the way of acceleration. A good example of this is the Zephyr, which is a plain tube type of carbureter. A ball valve has been added at the bottom of the air tube and when the throttle is opened it causes a lag of the air behind the gasoline. A sudden throttle opening for quick acceleration will cause a spurt of gasoline to enter the intake, thereby enriching the mixture and giving the qualities necessary for acceleration.

This same device acts as a help for easy starting. When the engine is stopped the ball valve drops to the bottom, thereby cutting the air supply and causing the primary starting suction to fall on the nozzle and the supply of raw fuel needed is given.

As far as methods of securing easy starting are concerned there have been no innovations during the year. The majority of carbureter manufacturers have come to use an easy starting tube which connects the intake above the throttle directly with the float bowl. This provides the heavy mixture for idling as well as for starting. When the throttle is closed a high vacuum is created even at slow rotative speeds, and this vacuum falls on this easy starting passage taking in a flow of pure gasoline. There are several variations of this basic method used on the different makes.

New Air Regulation Features

Two trends in connection with the starting problem are noteworthy. These are in the increased use of dash controlled air, to help out the automatic devices used on the carbureter, and the use of an increased proportion of heated air. Both these are matters which are up to the car manufacturer as well as to the carbureter maker. The use of jacketed intakes and steering column and dash controls has increased to such a large extent that one carbureter maker, Marvel, has had to bring out a modified design intended particularly for cars with very hot intakes. The modification was made by taking the standard model E design and removing the exhaust-heated jacket. The new carbureter is called model F. It is provided with a full heated air intake and it is claimed that with a well-heated intake and this pre-heated air, the carbureter is particularly suited to the low grades of fuel now in use.

Low Speed Performance Problems

While the demands for acceleration and easy starting have been high, it is doubtful if they have been as difficult to meet as the low speed performance requirements. When the eights and twelves began to show 3 and 4 m.p.h. on high gear, with ability to accelerate from that speed advantageously, the makers and users of sixes and fours, regardless of the fewer impulses per revolution, demanded quite close to the same thing for their cars, and put the

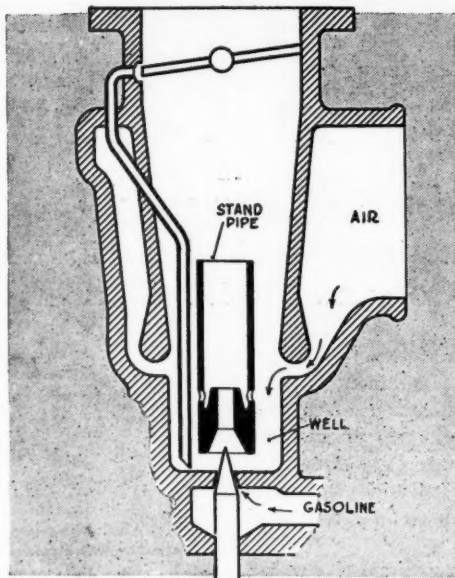


Diagram of new Holley model K, showing provision for feeding mixture direct into manifold above throttle for starting and low-speed work

matter up to the carbureter manufacturer.

It has always been recognized that carburetion difficulties are great at low motor speeds, because of the lack of energy at the carbureter jet. The mixing of air and gasoline in the proper condition for combustion is, after all, a mechanical proposition. It means so much work done, and therefore must involve the factors of load and distance. The energy supply is provided by the vacuum or suction. It is utilized in breaking up the gasoline, in drawing in the air, and carrying the combined charge into the intake manifold.

When an engine is turning over slowly the gas is not pouring into the cylinder at a high rate of speed, and naturally the kinetic energy necessary to break up the fuel is lower just at the time it is necessary to have the fuel well broken up to provide a good explosion for low speed work. By various means carbureters are ar-

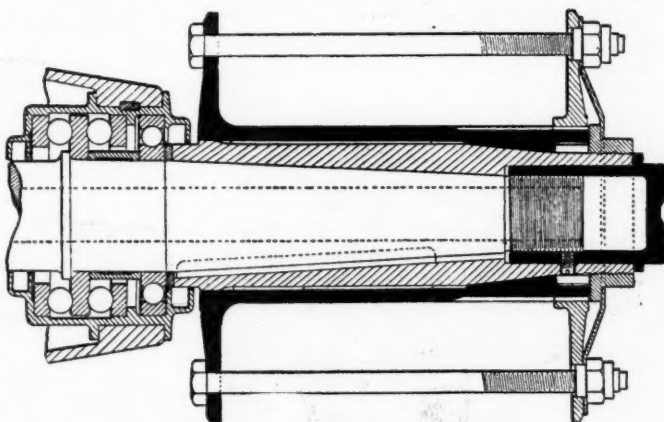
ranged to give a richer mixture at these low speeds so that what air is drawn in will be thoroughly saturated with the gasoline vapor.

Elsewhere the different types of carbureters are discussed individually. The constructions of carbureters are in as many different forms as there are carbureters. The problems all have to meet are the same and the foregoing will show what these problems are and how, in general, carbureter manufacturers are meeting them.

A German Aeroplane Propellor Hub

THE Aeronautic Engine Division of the Standards Committee of the Society of Automobile Engineers has been devoting considerable attention to the design and possible standardization of propeller hubs. At the first meeting it was suggested by Howard E. Coffin that a quick-detachable device similar to that of the Rudge-Whitworth wheel might be used and shortly afterward almost precisely this idea was patented by the Rolls Royce of England.

The accompanying illustration shows an application made to the British patent office by a German company shortly before the war. It will be noticed that there is a bush secured to the shaft by a key and a nut and that the actual propeller hub fits over the bush. Driving is done by teeth cut on the outer end of the brush and on the inside of the hub. These teeth are tapered so that when the hub is locked into position by the securing nut there can be no shake.



A German design of aeroplane propeller hub

Few Changes in Carbureter Design

Four Fundamental Types Still Unaltered—Two New Carbureter Constructions—Principles in Use Are Greatly Intensified as Compared with Models of a Year Ago

INDIVIDUALLY, carbureters have not been changed materially during 1916. The four fundamental types described in *THE AUTOMOBILE* classification of a year ago still hold true. Up to the date of going to press there are two new carbureters which differ materially from the products of the same makers of a year ago, and even these are not changed in basic principle as much as in mechanical structure.

Along the line, however, there have been refinements which are more in the nature of intensifying the principles already in use rather than in the introduction of new ones. The increased demands of the public and, in turn the car manufacturer, on one hand, and of the descending grades of fuel on the other, have made necessary alterations which carry out to an even greater extent the purposes which were clearly defined in carbureters a year ago.

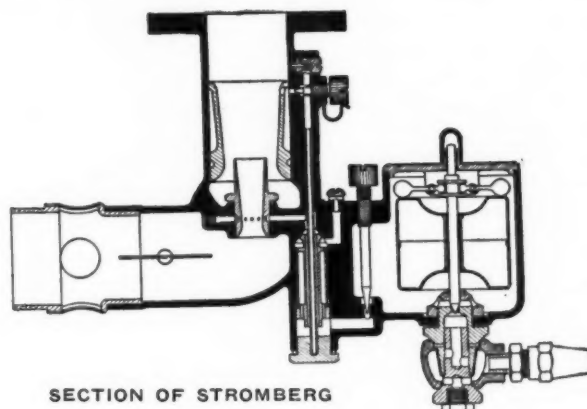
A greater amount of heat, a finer division or atomization of the fuel and a higher velocity of the mixture are the three basic improvements. All three of these can be traced directly to the heavier fuel to a greater extent than to the higher demands of the manufacturer, although both play their parts.

Three types of carbureter are almost equally popular. The air valve type, in which compensation for varying throttle openings is made by the air valve, has 28 per cent. The metering pin and compensation jet classes each have 25 per cent. The expanding type numbers 11 per cent, and the miscellaneous groups, which are not distinctively under any of the above heads has also about 11 per cent. There are some carbureter manufacturers whose products fall under more than one of the above classifications.

While the air valve type is numerically slightly stronger than any of the other classifications, the compensating jet class has gained two powerful recruits during the year. Stromberg is just adding a new carbureter of this type whereas its former designs were of the air valve class. There is also the new Holley which belongs under this head.

Differences in Stromberg

The new Stromberg compensating jet carbureter is a plain tube type, all air being preheated and taken through a straight, uninterrupted tube. It is made in both horizontal



SECTION OF STROMBERG

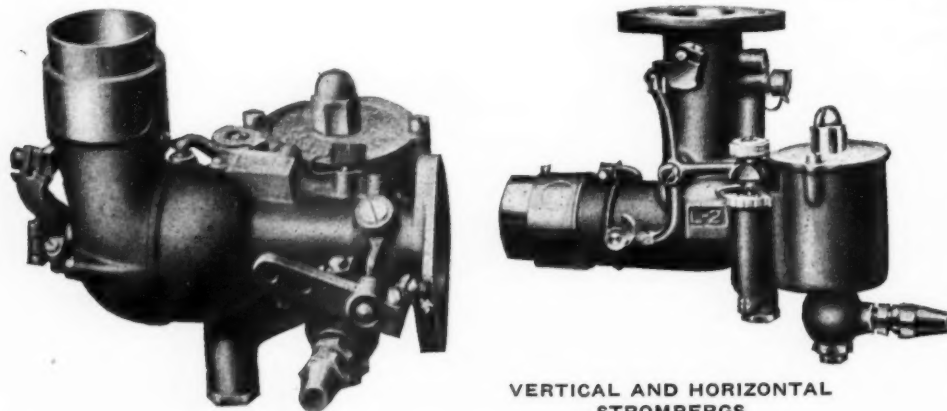
and vertical types and in style adapted to passenger cars, as well as constant load vehicles, such as trucks, marine engines and tractors.

The new plain tube carbureter differs from the previous types of Stromberg, particularly in what the Stromberg company calls an air-bleed jet. In this the air is introduced into the gasoline before it emerges from the jet. The jet has a series of holes drilled around the throat of the venturi. There is also an arrangement for supplying a small quantity of gasoline above the throttle in idling.

Three features are incorporated in the new carbureter to meet the demands for easier starting, better idling, and acceleration with low grade gasoline. The first of these is the air-bleed jet which consists in the introduction of a small, measured amount of air into the gasoline jet before it sprays out into the main air passage. This air forms a series of small bubbles which atomize the fuel and break the surface tension, causing it to flow readily at a low vacuum. The introduction of the air is dependent upon the suction in the manifold and thus the flow corresponds to the vacuum in the intake and is proportional to the air flow through the plain tube.

Referring to the sectional view of the carbureter, it will be noted that gasoline leaving the float chamber through a regulating orifice rises through a vertical channel, while air drawn in by suction through the protecting cap discharges into the gasoline channel or air-bleed jet, breaking up the gasoline which issues in a number of small jets into the high velocity air stream in the venturi passage.

The second feature is the accelerating well. A small pool of gasoline is kept in communication with the main fuel passage so that at low throttle a supply of gasoline accumulates here and is held ready to supply the needs of a quick throttle opening for acceleration. When the extra demand is relieved, the gasoline in the well again returns to the normal level of the



VERTICAL AND HORIZONTAL STROMBERGS

fuel in the float chamber of the carbureter.

The third feature of the new Stromberg is its idling arrangement by means of which at closed throttle a small quantity of mixture flows directly into the manifold above the throttle so that the suction at idling speeds is sufficient to carry into the intake a column of gasoline from the float chamber.

Starting with fully closed throttle, the carbureter first draws gasoline from the small idling opening above the throttle. Then, as the throttle is opened further, gasoline is drawn from the main orifice into the venturi in the plain tube. At high speeds the air velocity through the venturi in the plain tube is so great that practically no fuel passes through the idling nozzle.

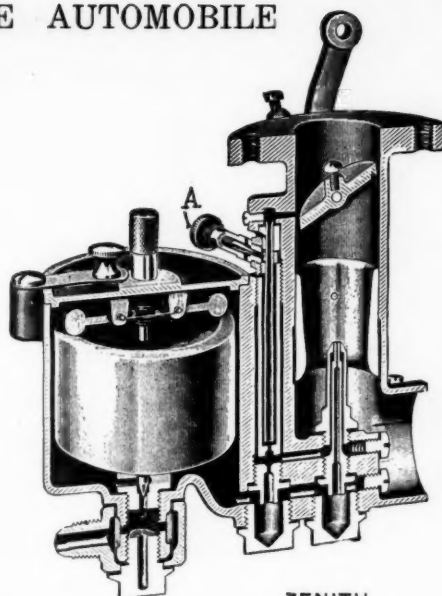
An economizer has been added to the Stromberg carbureter which is designed to produce a richer mixture needed for power at wide open throttle. This is a T-shaped part, having at its upper end a roller resting on a cam which turns with the throttle, and its lower end resting on a second cam operating the main air shutter. The horizontal portion of the T ends in a shoe upon which rests the adjusting nut, controlling the high speed gasoline meter. The shape of the cam on the throttle is such that the needle is raised slightly at closed throttle, lowered for ordinary driving positions ranging from 15 to 35 m.p.h., and raised again as the throttle is opened for speeds above this. A rich mixture for starting also is provided by cam on the main air shutter which raises the needle slightly, giving a rich mixture.

New Holley Instrument

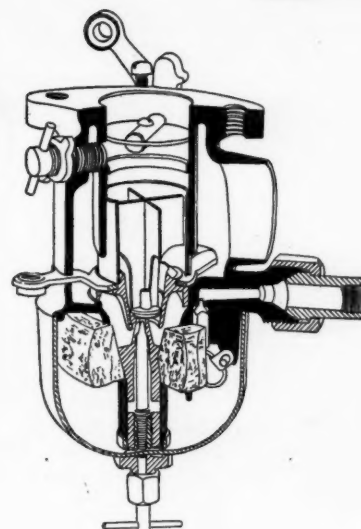
The new Holley compensating jet carbureter is an improvement over the previous Holley in that it has an increased capacity with decreased fuel consumption. The new model is known as K and the model G, Ford type, and the HA are continued without change, except for detailed alterations in the float mechanism, giving a better fuel control. The mixture flow is regulated by the vacuum at the jet, the intensity of which is controlled by the amount of throttle opening and by the varying positions of the actual air throat in the choke tube from which it is transferred to the jet by means of a standpipe, the constructional being shown in the illustration. The standpipe extends up from an accelerating well, in which gasoline lies in a pool for use when throttle is closed.

As the throttle is opened wider, the gasoline does not have time to fill the well and hence a mixture of air and gasoline is taken up. The wider open the throttle, the greater the proportion of air, giving the compensation effect for high speeds. The only adjustment is the needle valve at the bottom which governs the flow of gasoline into the well.

The Ford type is the same as the above in principle



ZENITH



JOHNSON

but has no standpipe. It has, however, a well and all the Holley models have an easy starting tube which leads the gasoline from the well to a point above the throttle. There is also a dash-operated choke on the air line.

Zenith Unchanged

No new Zenith carbureters have been introduced during the past year. The models which are being continued over are L, O, HP and OD (Duplex). The only alteration on these is that on the Duplex type there are individual butterfly adjustments.

The flow in the mixture in Zenith carbureters is accomplished by regulation of the nozzle opening and by regulation of the air supply. This brings the carbureter into the compensating jet class. Uniform vacuum is maintained in venturi and elements depended on to secure vaporization of low grade fuel are, finely divided jet spray, high velocity and heat.

The carbureter has as a primary the fixed nozzle in the venturi. The secondary jet surrounds the primary and feeds fuel through the same venturi. The secondary jet draws its supply of gasoline from a well at the bottom of the easy starting tube. At idling speeds this tube is full of gasoline up as far as the level in the float chamber, thus feeding a rich mixture. At running speeds the gasoline in the tube is exhausted and the flow is sucked through the well passage into the secondary jet along with a supply of air. There is an idling adjustment on a needle valve and no other adjustments on the carbureter.

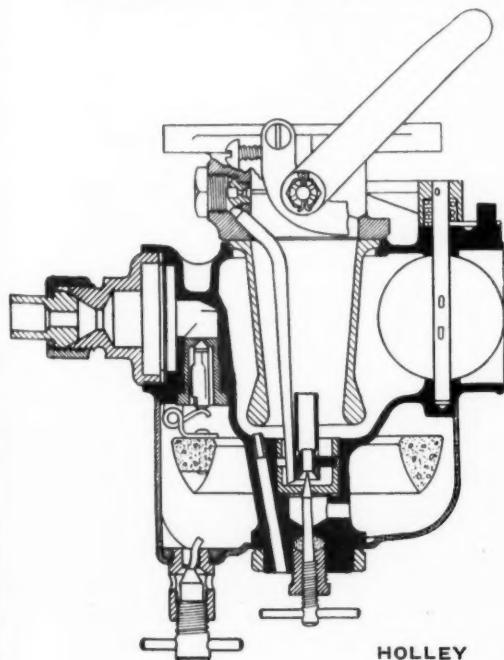
In buying Zenith carbureters the make and year of the engine should be known as the jets and choke passage must correspond. As in all carbureters the intake should be the same diameter inside as the carbureter. There are no special points in installation which do not apply to all carbureters.

No New Johnson Models

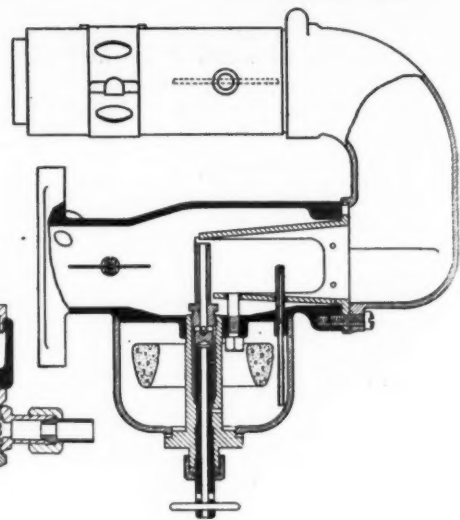
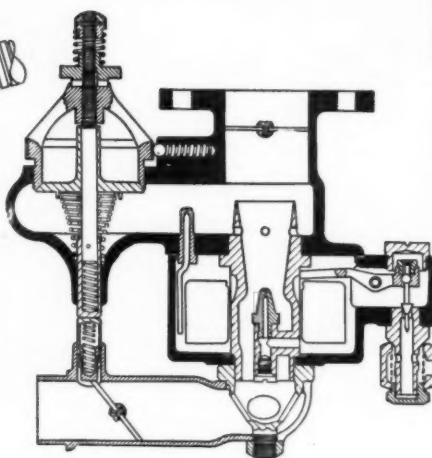
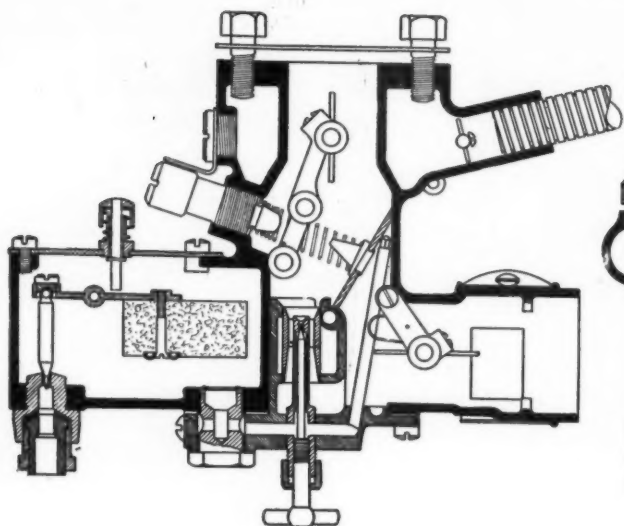
No new models have been added to the line of Johnson compensating jet carbureters. In this, the fuel flow is governed by an automatic sleeve air valve in a cylindrical mixing chamber. The cylindrical sleeve is concentric and carries a small plate at the bottom which regulates the jet passages and governs the mixture. In operation, suction of the engine raises the sleeve, allowing it to float automatically at the proper level to secure the correct jet area. There is a dash choke which rotates the strangling tube, shutting off all air.

Marvel Adds New Model

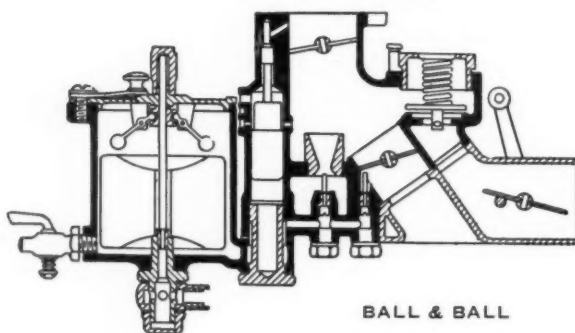
A new compensating jet model, known as F, has been added by the Marvel company. As far as the carburetion



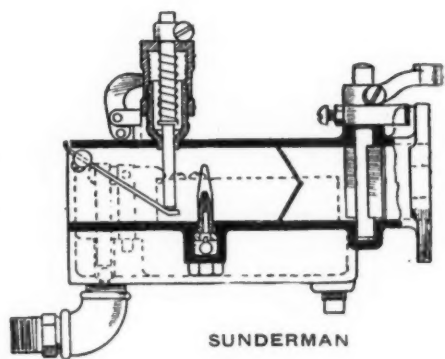
HOLLEY



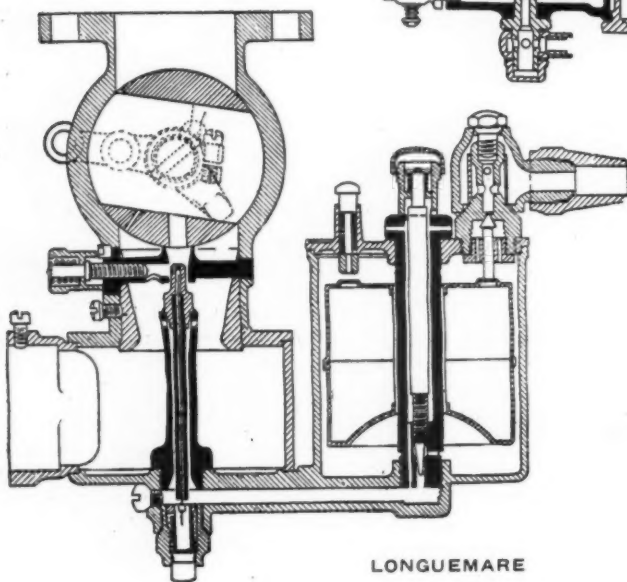
ABOVE FROM LEFT—
MARVEL, FLECHTER
AND TILLOTSON



BALL & BALL



SUNDERMAN



LONGUEMARE

elements are concerned this is the same as the previous model, E, but it is designed for engines with hot intakes and consequently it is made without the exhaust-heated jacket used on other Marvel carbureters. In addition to the new model, the standard model E and the model N Ford type have been continued with improvements. The alterations are in the nozzles, jets and air valves, which increase the velocity and at the same time atomize the fuel more finely. The fuel flow is regulated by an auxiliary high speed jet which is uncovered by the auxiliary butterfly air valve. The fuel is vaporized by the spray nozzle jet in the venturi and by the application of heat.

Ball & Ball Two-Stage Type

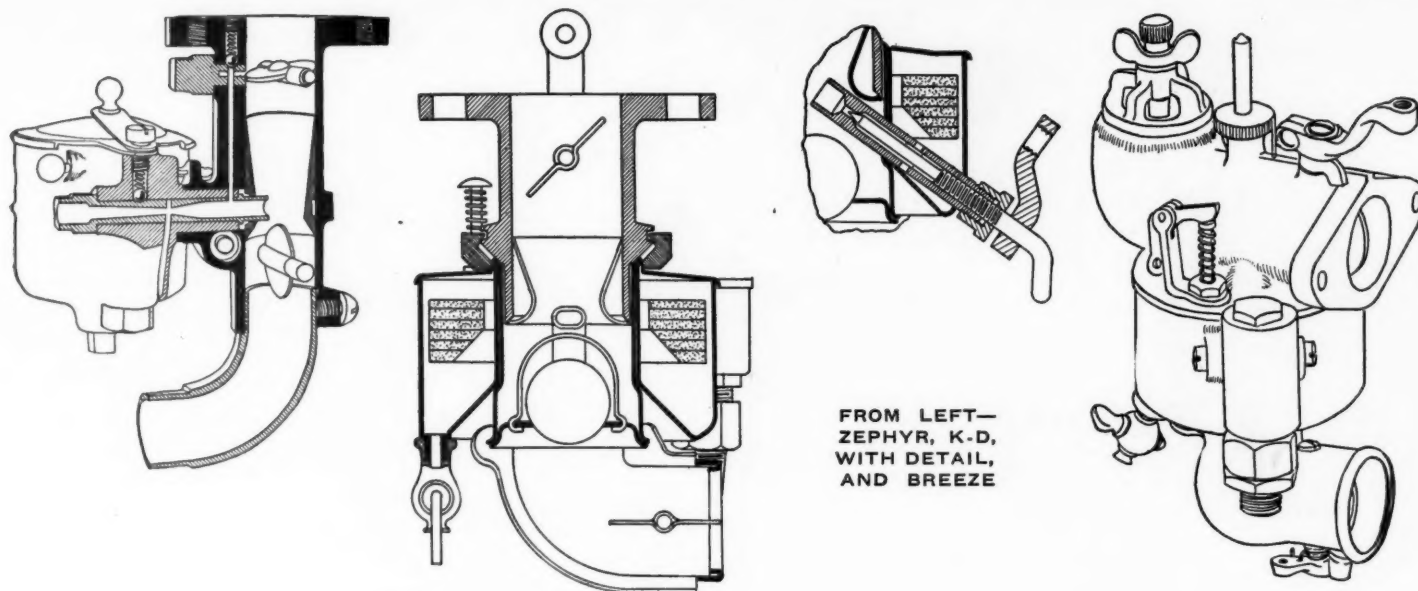
An interesting compensating jet model is the Ball & Ball, which its manufacturers call a two-stage instrument. It is really two carbureters in one, the primary being made up of a simple jet in a venturi passage. The second stage comes into play when the throttle is open and is made up by an in-

dependent air passage containing a separate air valve which uncovers the compensating jet. For easy starting, there is a passage which leads from the float bowl to a point above the throttle. In this passage there is a plunger which acts as a pick-up device. As the throttle is opened the vacuum in the intake passage is broken, allowing the plunger to fall and causing gasoline to gather above it. This is immediately drawn through the pick-up passage, giving the desired mixture for acceleration. There are no adjustments on this carbureter.

Tillotson, Flechter and Longuemare Unchanged

Three other carbureters, the Tillotson, Flechter and Longuemare, which are in the compensating jet class are unchanged. The Tillotson, which is known for its use on the Willys-Overland cars, has added a new model, however, which is simply the previous model B converted into a vertical type instead of being horizontal. In the Tillotson carbureters, a uniform partial vacuum at the fuel nozzle is maintained by means of two easy-yielding flexible reeds mounted on a cage designed so that the maximum opening takes care of the volume required to fill the combustion chamber at maximum speed. When the reeds are seated the primary nozzle supply is located in a small choke passage to give the highest possible vacuum at low throttle openings. The virtual effect of these flexible reeds is to give a variable venturi. Only one air inlet is used so that a sufficient amount of heat is supplied for vaporizing the heavy fuel.

In the Flechter carbureter, the mouth of the venturi inclosing the main nozzle is carried up higher than the compensating nozzle. In operation the primary nozzle takes care of low speeds and when the throttle is open the auxiliary air valve drawn air passed the compensating jet. The latter leads into a well which is open to atmospheric pressure, so that at high speed air is taken through this jet, while at lower speeds gasoline also enters through it. This gives the necessary compensation.



FROM LEFT—
ZEPHYR, K-D,
WITH DETAIL,
AND BREEZE

In the Longuemare, the main jet is shut off with closed throttle. As the throttle is opened the main nozzle comes into use and a further opening draws a mixture of air and gasoline through the supplementary nozzle. Thus, the compensating jet is directly functioned by the throttle.

Sunderman a Compensating Jet Type

Sunderman carburetors belong in the compensating jet class. There are two tapered nozzles at right angles to the

air flow and the passage of the air past them creates a high vacuum directly at the nozzles. The mist thus formed is further broken up and gasified by passage through a screen.

In operation, as the motor is started, the suction raises the air valve which is held closed merely by gravity. The valve opens just sufficient to permit the air to sweep over the lower of the two nozzles. As the engine speed increases, thus increasing the suction, the air valve raises higher, thus bringing into play the second nozzle which is higher.

Air Valve Types Are Most Numerous

INCLUDED in the air valve types are the Zephyr, Air Friction, Browne, Branford, Breeze, Shain and K-D. Of these, alterations have been made during the year by Zephyr and Air Friction. The Branford, which at present is supplied only in the Ford size, will be made in all sizes after Jan. 1, 1917, without change in principle.

The air valve carburetors are probably the most simple of all types. Either automatically or mechanically an auxiliary valve opens at higher speeds, decreasing the richness of the mixture to take care of the needs of increased speeds. Primarily, the auxiliary air valve is necessary to relieve the vacuum at the main jet caused by the increased velocity of the air current. As engine speeds increase beyond 1000 r.p.m. the auxiliary air valve becomes necessary, and it was from this type that the inspirations for the more complicated automatic devices were drawn.

Zephyr Adds Ball Valve

The Zephyr is a plain tube instrument which has been refined this year by the addition of a ball valve at the bottom of the tube. The object of the change is to put more suction on the gasoline jet, thus securing better atomization of the heavier gasoline. The standard Zephyr type without the ball valve is being continued. A uniform partial vacuum is maintained by the venturi shaped air passage, through which the air flows at right angles to the main jet. In the new model the ball valve is seated at the bottom of the tube with a smaller air valve above it, so that primary air is taken above the ball and the auxiliary air secured by lifting the ball with the vacuum in the intake. The air through the primary opening is heated, and through the opening below the ball is cold.

The atomizer and jet runs from the float bowl into this air passage at right angles and the velocity of the air over the interior end of the atomizer creates sufficient vacuum

within it to spray the fuel into the venturi-shaped mixing chamber. The atomizer has four different jet openings which line up with the intake from the float chamber. The adjustment is made by turning it until the proper opening is in line. There is also a throttle jet which is in the form of a tube running above the throttle, acting as an easy starting device and idling feed, on closed throttle. A starting shutter in the bottom of the air tube throws all the suction on the atomizer and insures a good starting mixture.

Browne Has Changeable Intakes

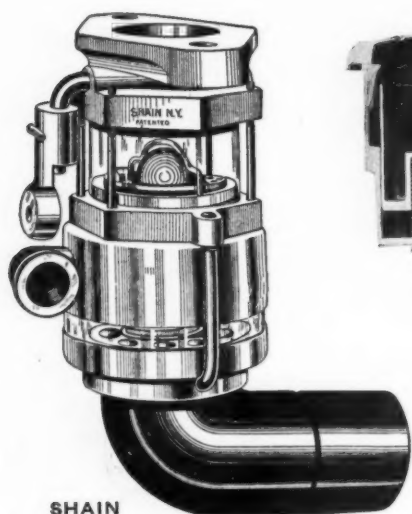
Browne carburetors belong in the air valve class though the air valve in this case is controlled directly by the suction in the venturi. The auxiliary air valve is an aluminum cup held on its seat by a spring and sucked open in proportion to the speed of the engine by the rush of air passing and opening directly opposite the fuel nozzle. Therefore, any change in the fuel flow automatically changes the quantity of air mixed with the fuel. The internal construction of the Browne is scientifically proportioned to the requirements of the motor. The size of the venturi and of the auxiliary air inlet is changeable, and is determined by the piston displacement of the motor.

Breeze an Air Valve Construction

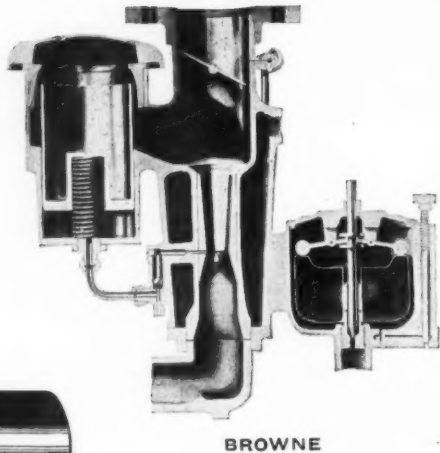
The Breeze carburetor is a simple air valve type. The incoming air passes through a venturi inclosing the fuel nozzle so that the suction determines the quantity of fuel drawn through the nozzle. As the mixture would be too rich at high speeds without the addition of more air, there is an auxiliary air valve controlled by a spring.

Air Friction Is Unchanged

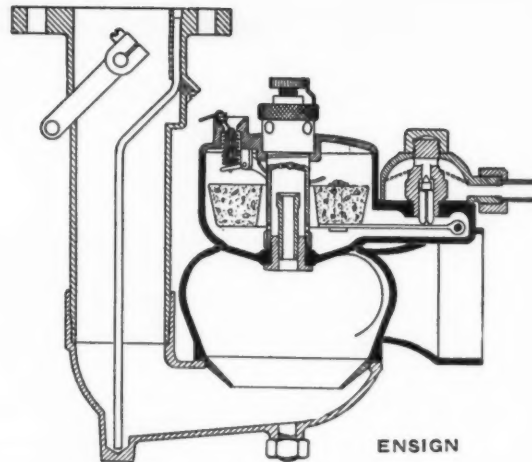
Air Friction carburetors are of the air-valve type in which the auxiliary air valve maintains the proper proportions of



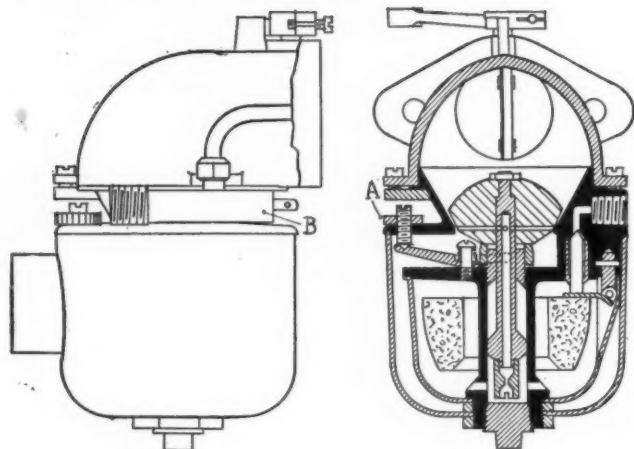
SHAIN



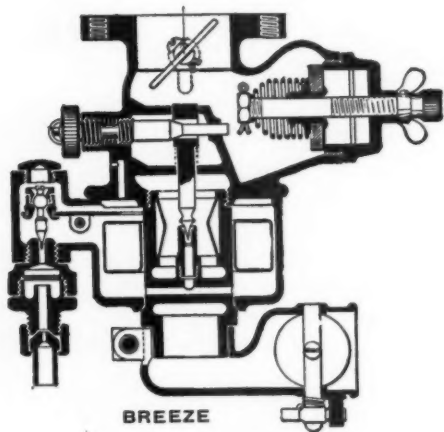
BROWNE



ENSIGN



TWO VIEWS OF BRANFORD



BREEZE

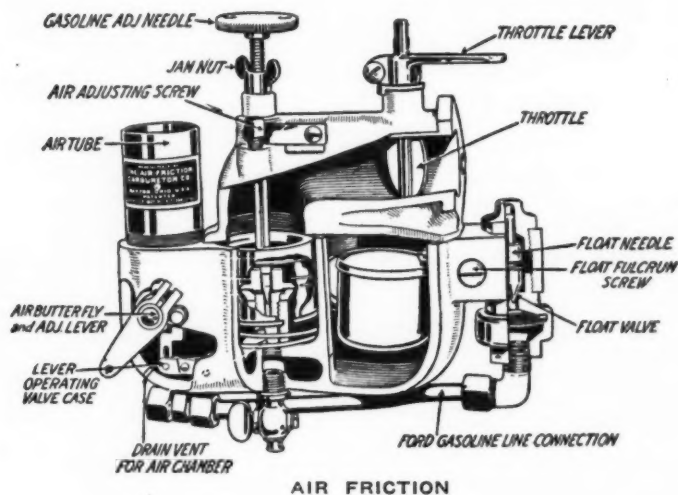
gasoline and air. There has been only one change in this carburetor for 1917 and this consists in an improvement in the spray nozzle, holes being drilled in the lower collar.

K-D Has One Adjustment

Belonging in the weighted air valve class, the K-D is a simple instrument in which there is but one adjustment. Air entering the intake lifts a ball which permits the proper amount of air to enter the carburetor in proportion to the speed of the engine. As the air enters it picks up fuel from a single nozzle which projects into a venturi.

Shain Uses No Float

The Shain carburetor is a combination of weighted air valve single jet types. The jet is normally closed by a



AIR FRICTION

bronze ball which is raised off its seat by the rush of air thus permitting a certain quantity of fuel to mix with the air. There is no float, the ball over the jet preventing leakage of fuel when the motor is stopped.

In operation, the rush of air causes the ball to rotate and thus to throw out a thin mist of gasoline which is mixed with the air, which also is rotating, and thus passes on to the cylinders.

Branford Employs Constant Vacuum

The Branford carburetor belongs in the constant-vacuum weighted air valve class. The fuel is drawn up through the center of this weighted air valve and issues from orifices around the circumference of the valve where the velocity of the air is greatest. Inasmuch as the amount of fuel picked up is governed by the velocity of the air passing the fuel nozzles and the velocity in turn is controlled by the vacuum which remains practically constant, the quality of the mixture does not change with the change in volume required by the motor.

At present but one size for Fords is made but at the New York shows there will be on exhibit a full line operating on the same principle and intended for all makes of cars.

Ensign Is Different

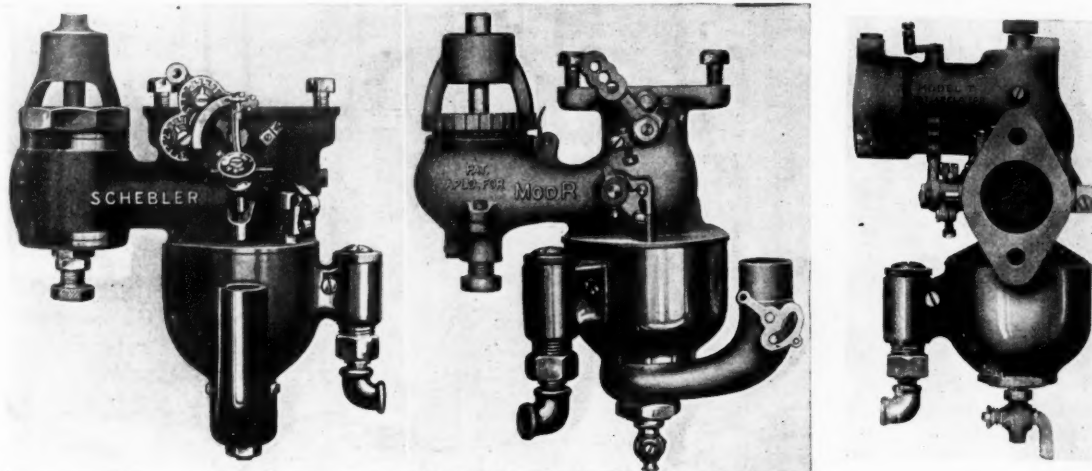
The Ensign carburetor is radically different from anything else of the kind. The mixing chamber is directly beneath the float chamber. Air enters the mixing chamber and is converted into a whirling current which centers about the fuel inlet. Suction on the fuel inlet draws fuel into the air where it is thoroughly mixed. Admixture is assisted by the passage of the mixed gasoline and air through a constricted area before it enters the outlet to the manifold.

To permit the richer mixture required by extreme low running there is an unbalanced butterfly valve in the intake. This is horizontally placed and when the motor is idle hangs down so that the intake is partly closed. The slowest air movement causes it to shift its position so as to increase the

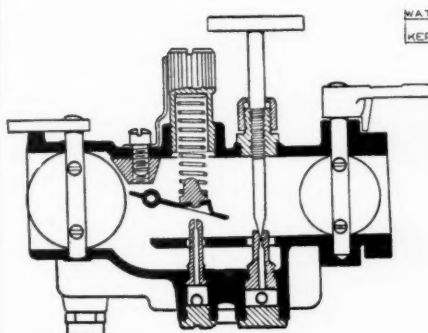
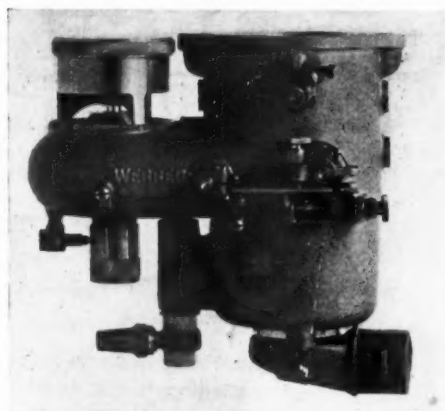
amount of air admitted. It affects the working mixture only at extremely slow speeds.

The carbureter is made in three types, for gasoline, distillate and heavier fuels and is made in all the usual sizes from 1 in. to 2½ in. varying by ¼ in. sizes.

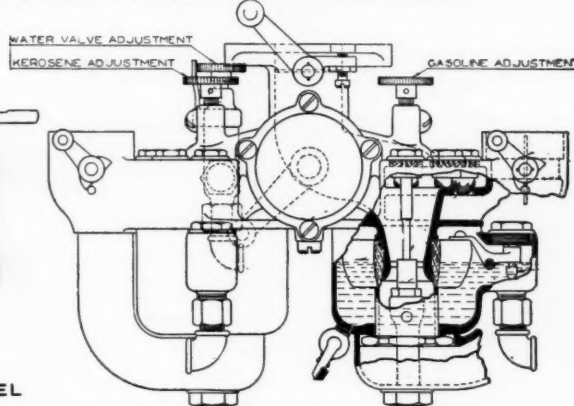
Some Standard Carbureter Designs



THREE SCHEBLER MODELS, ALL IN THE METERING PIN CLASS



FROM LEFT, WEBBER, MARVEL
AND KINGSTON



Carbureters of the Metering-Pin Class

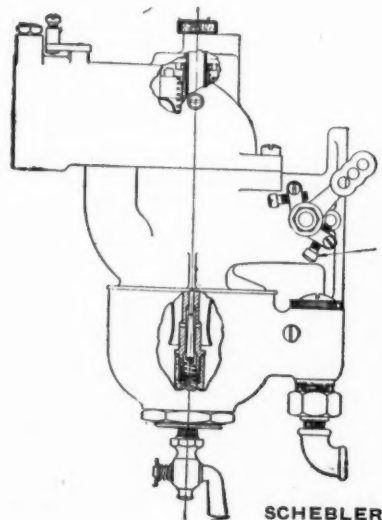
SOME of the best known carbureters used on up-to-date cars are classified as metering-pin carbureters. They include such makes as Schebler, Stewart, Rayfield, Newcomb, H & N, Webber, Heath and Tom Thumb. In this type, the raising and lowering of a calibrated pin governs the size of the fuel opening in proper relationship to the engine requirements.

Wheeler & Schebler has a new model which is just about ready for announcement, although details cannot be furnished at this time. Aside from this, there are no new models, those which are carried over being R, L and P. These are what may be termed the overcompensated type in which the needle is lifted to a greater extent than normally would be required giving a wider fuel opening with the proper air compensa-

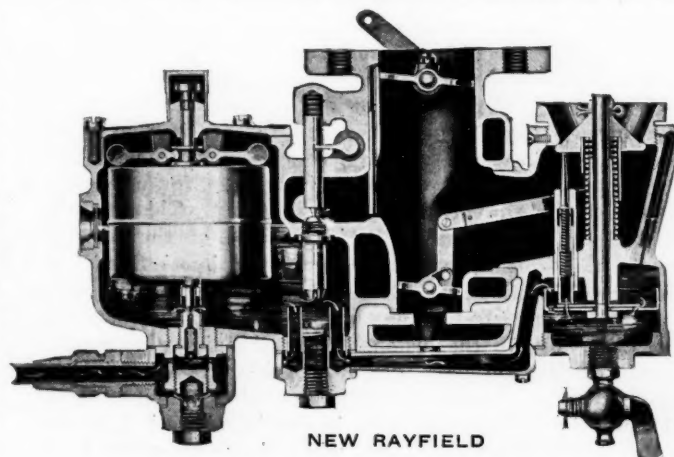
tion secured through the air valve. The needle is hooked to the air valve and when the latter lifts it lifts the needle. This applies directly to the model L and the model T is inverted type of model L and R, in which the needle is depressed to open. Proper atomizing of the fuel is provided by the velocity of the air carrying the fuel off the nozzle, by maintaining a large velocity and by heating the air.

Rayfield Metering Pin Improved

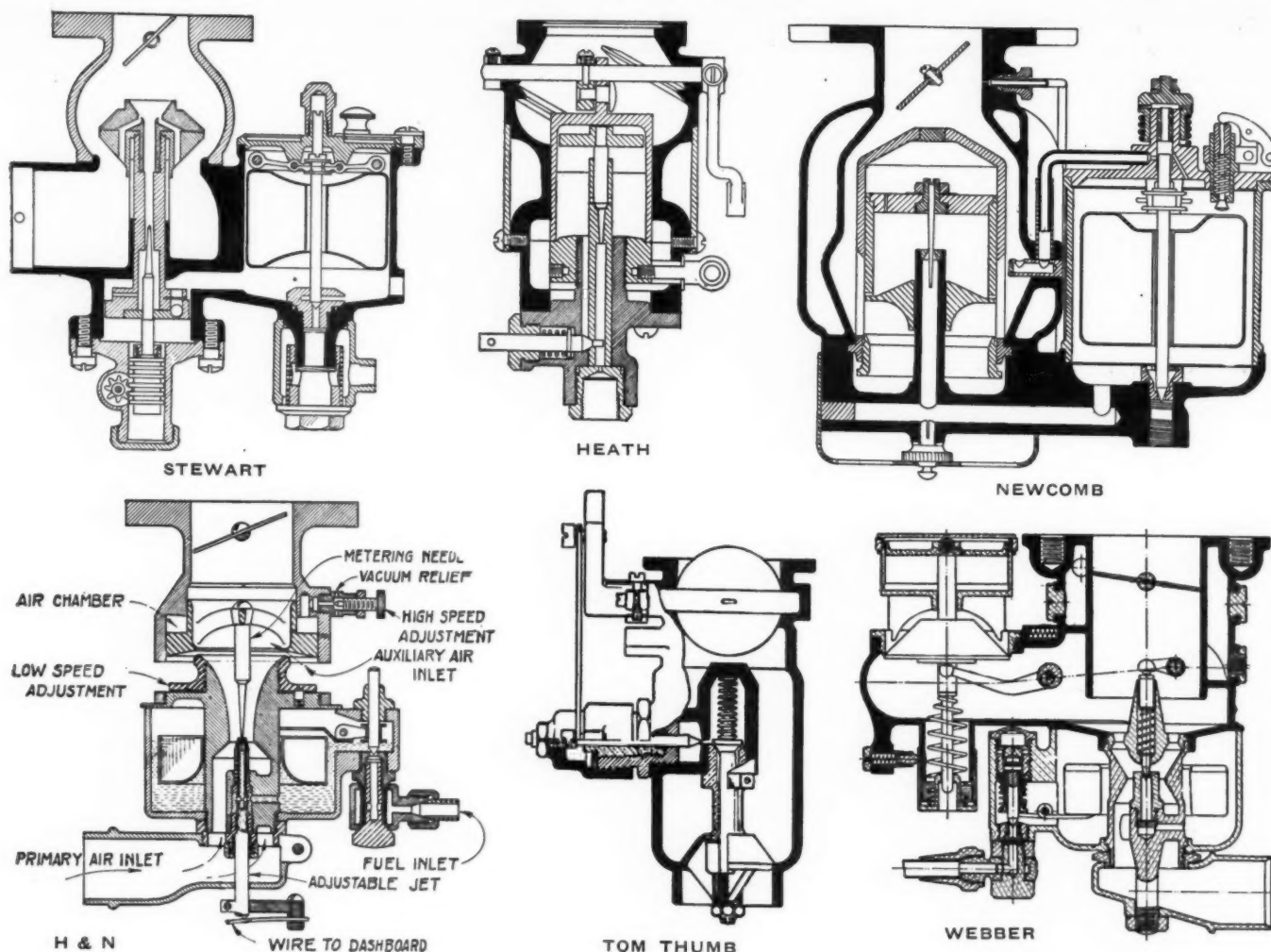
The chief improvement in Rayfield carbureters is the re-



SCHEBLER



NEW RAYFIELD



arrangement of the metering pin, which is operated by the upper air valve. Previously this pin was held against the air valve by a spring, and the valve had to overcome the reaction of the spring to operate it. Now the metering pin rides on the dash pot piston, which is on the lower end of the air valve stem, and moves upward and downward with the valve, but without requiring any greater effort by the valve.

Findeisen & Kropf, the manufacturers, are continuing the model G as the chief feature of its production program for 1917. This is not a new model, but the above detail refinements designed to give quicker acceleration and take care of the lower grades of fuel have been made. While the model G is the prominent one of the line, there is a model L the same in every respect except that it is not water-jacketed, which is the horizontal type of the model L.

Rayfield is classified as a metering pin type, but it goes further: It incorporates an auxiliary nozzle, which also has a metering pin which is depressed when the auxiliary air valve opens. Thus by having two distinct nozzles it establishes its right also to be classified as an expanding type of instrument. But Rayfield goes still further in that it combines a pumping action on the gasoline in the auxiliary nozzle whereby a very rich mixture is furnished for acceleration whenever the air valve is opened suddenly. This is accomplished by the piston on the lower end of the air valve stem, this piston working in a dashpot filled with gasoline. Gasoline enters the dashpot above the piston and is admitted to the space below the piston by the disk valve in the piston. When the air valve suddenly opens, forcing the piston downward, this disk valve is closed automatically, forcing or pumping the gasoline upward through the fuel passage into the nozzle, where it is sprayed into the inrushing air. Only when the valve opens is this

pumping function occurring and at other times the gasoline issues through this auxiliary nozzle according to the suction of the motor. Thus Rayfield is a compound of two metering pins in conjunction with the pumping function for acceleration. The dashpot also prevents air valve fluttering.

Stewart Line Unaltered

No new models and no changes are incorporated in the Stewart line. This is a metering type of carburetor in which the vacuum at the jet is controlled by the weight of the metering valve surrounding the upright metering pin. The only moving part is the metering valve which rises and falls with the changes in vacuum. The air chamber surrounds the metering valve, and there is a mixing chamber above. As the valve is drawn up, the gasoline passage is enlarged on account of the predetermined taper on the metering pin and the air passage is also increased proportionately, giving the correct mixture. A dashpot at the bottom of the valve checks flutter. In idling the valve rests on its seat practically closing the air and giving the necessary idling mixture. There is a passage through the valve which acts as an aspirating tube. When the valve is altogether closed the primary air passes through ducts in the valve itself, giving the proper amount for idling.

Newcomb Adds Pulverizing Plunger

Newcomb carburetors belong in the metering pin class and have had a pulverizing plunger added. The reason for this plunger is to more thoroughly mix the gas line and air and thus to assist in its vaporization. In addition to the main nozzle there is an auxiliary nozzle which leads to a point opposite the throttle to assist in starting.

Air entering the carburetor lifts the pulverizing plunger

which in turn lifts the needle out of the nozzle, permitting a certain quantity of fuel to escape into the chamber. This fuel passes through a number of small holes at the bottom edge of the plunger, these holes registering with an equal number of narrow air slots in the plunger tube. The air rushing through these slots mixes thoroughly with the fuel. The head of the plunger and the upper end of the plunger chamber form a dashpot.

Webber Metering Pin Models

Several models of metering pin types of Webber carbureters are made and they all operate on the same general principle. The nozzle is located in a venturi, as usual and the size of the orifice is altered by raising a needle, or pin, out of it through interconnection with the auxiliary air valve. The peculiarity of the Webber is that the mixture of air and gasoline, after leaving the nozzle, is caused to pass through a series of smaller venturi tubes arranged in a circle around the main venturi and above it. This causes the air and gasoline to be thoroughly mixed and vaporized.

H & N Control by Auxiliary Air

H & N carbureters belong in the metering pin class in which movement of the measuring device is controlled by the auxiliary air through an air dash pot. The primary air

passes through a venturi, picking up its fuel from the nozzle in passing. For low speeds the fuel nozzle remains unchanged but at higher speeds the opening of the auxiliary air valve raises the metering pin and proportions the gasoline to the air which is flowing through the carbureter.

Heath Employs Vacuum

The Heath carbureter belongs in the metering pin class in which the quantity of fuel is proportioned to the air by the action of an air valve operated by the vacuum induced in the carbureter. In principle there is a valve floating on a tubular shaped column of air which rushes past the six openings of the fuel stud. The position of this valve depends upon the volume of air going through the carbureter and as the valve lifts it lifts the metering pin with it.

Tom Thumb

The Tom Thumb carbureter is a metering valve type in which the opening of the throttle increases the opening of the fuel port around the needle. This is accomplished by a connecting rod which turns the needle on a coarse thread to pull the needle away from the opening. When the engine is at rest a shut-off valve is pushed to a closed position by a spring. When the engine is running this valve is held open by the air valve. The fuel outlet is through six small holes.

Expanding Types Include Interesting Designs

ALTHOUGH the expanding types of carbureters are only 11 per cent of the total, they include some of the most interesting of all the modern designs. Among them are the Master and Carter. In these carbureters the jets come into action as they are needed starting with a primary for idling with jet after jet contributing its share of fuel as the throttle is opened further.

Master in Single Model

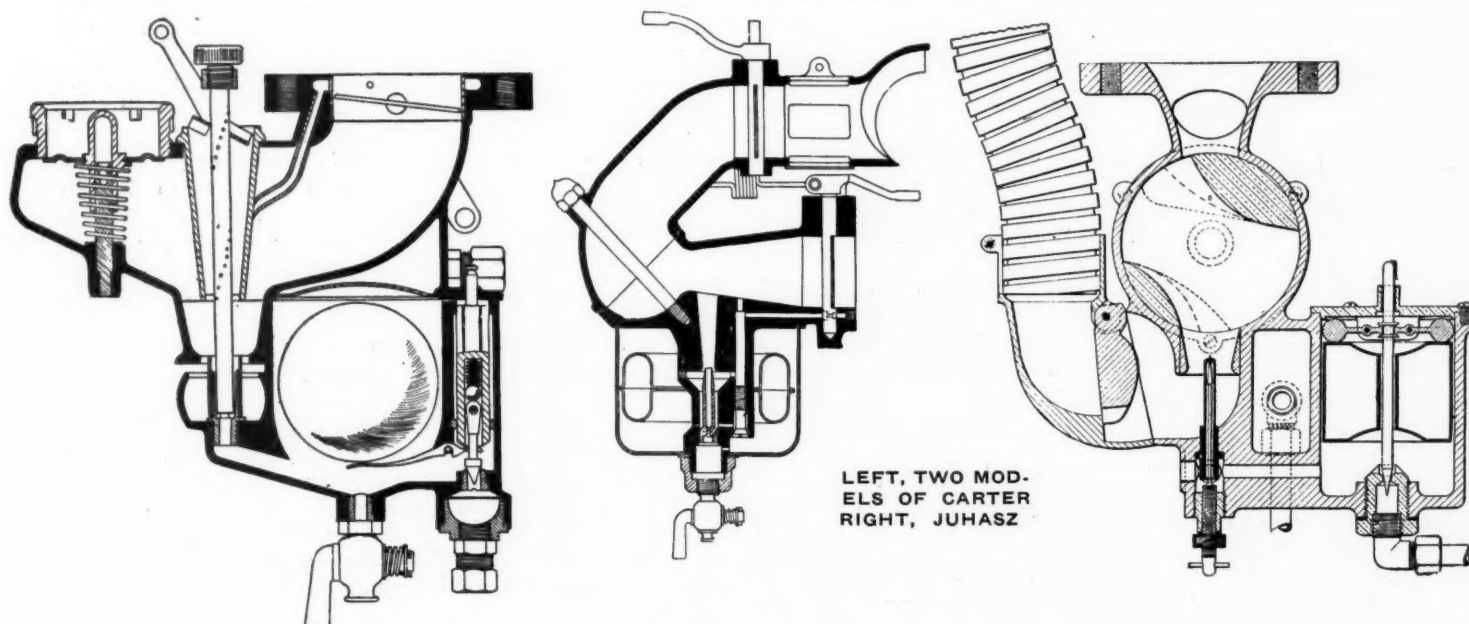
The Master carbureter is continued as a single model. Its principle of operation is the breaking up of the fuel by means of a series of jets which vary in number from 14 to 21, according to the size of the carbureter. These are uncovered by opening the throttle which is curved—a patented feature—in order to secure the correct progression of jets. The carbureter has an eccentric float chamber from which the gasoline is led to the jet piece from which the jets stand up.

The tops of these jets are closed until the throttle is

opened far enough to pass them, which it does progressively. The air opening is at the bottom and the throttle opening is such that a modified venturi is formed. The throttle is carried in a cylindrical barrel with the jets placed below it and the passage from the barrel to the intake is arranged so that there is no interruption in the flow. For easy starting there is a dash-controlled shutter which closes off the air, throwing the suction on the jets, thus giving a rich mixture.

The only adjustment is for idling and once that is fixed it need never be touched. This is in the form of a screw and regulates the position of the throttle when at idling position. The dash control has high-speed, normal and rich starting positions.

The minor modifications on the Master are as follows: New design brackets for float weights, formerly integral lugs on cover. New steel stamping locked to float chamber with projections which fit into slots. This locks cover on float, whereas a circular wire was used. Float needle now monel



LEFT, TWO MODELS OF CARTER
RIGHT, JUHASZ

metal instead of brass. All hot air now instead of semi-hot air.

New Carter Warms All Air

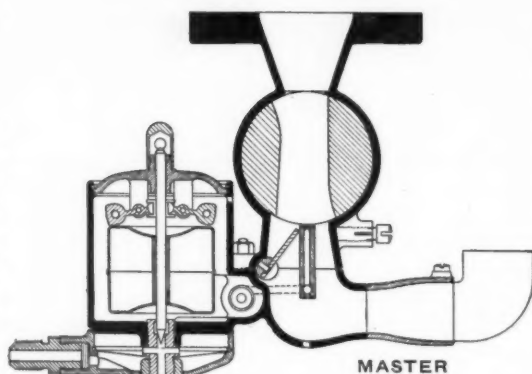
It has been mentioned that the three basic methods for taking care of the heavier fuel are by increased heat, better atomization, and higher velocities. The Carter carburetor uses all three, in its new model L which has just been put on the market. All the air that enters the new Carter instruments is warmed and comes through one opening. It is brought into contact with the various jets by means of venturi tubes permitting the passage of an exceptionally large volume of air to the engine with noteworthy increase in power and passing the jets at a very high rate of speed, thus greatly assisting in the atomizing process.

Five Models of Same Type

There are five models of Carter carburetors, all being the automatic expanding type. These are models C, hot water jacketed with low and intermediate adjustments which can be sealed after being set, designed for replacement business, on account of adjustability to varying conditions; Model CH, similar but designed for six, eight and twelve-cylinder cars; Model F, used for equipment purposes and also for special Ford outfit. It has no adjustment except a limited one for the float level. Model H is similar except that it has a steel float chamber. Model L has all the air received through one intake. It is designed especially for speed and power and easy starting. It is used only for equipment purposes except in the Ford outfit.

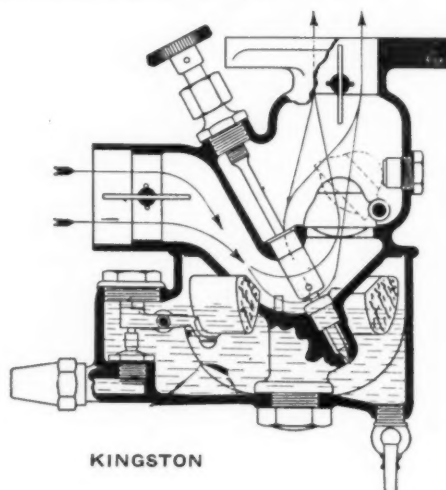
Juhasz Has Fixed Orifices

The Juhasz instrument belongs properly in the expanding carburetor class. It has a number of fixed orifices which are



uncovered progressively as the rotary throttle is opened. Each orifice gives in effect an independent carburetor. At slow speed only one orifice is in operation and as the throttle is opened the second, and then the third, orifice comes into operation.

There are only three moving parts: the rotary throttle, the float and an auxiliary gravity operated air valve to control the admission of air to the middle carbureting chamber. With the throttle closed this valve is on its seat and permits just sufficient air to pass to give a rich mixture for idling. As the speed of the engine is increased the air valve lifts, increasing the flow of air in proportion to the increased flow of fuel and thus keeping the fuel supply in the proper proportion for various throttle conditions.



Kingston in Miscellaneous Class

NONE of the four classifications given above suits the Kingston carburetor. Several Kingston carburetors are produced. For pleasure car use there is the Model L, which is applied as stock equipment on a large percentage of the Ford cars, and developed with slight changes for application to other cars. In addition, there are a number of models brought out for tractor, marine and stationary service under the general designation of Inclosed type, being designed for operation under conditions in which there is a great deal of dirt and dust in the air, the feature being that all the air is taken in at one intake, which may be protected from dirt. Of these, the Kingston Duplex is the most interesting, as it is arranged to operate both on kerosene and gasoline, having two float chambers, two nozzles, two mixing chambers, with a three-way valve to the manifold. Thus, it is in fact two distinct carburetors, one for gasoline and one for low-grade fuel, having only the connection to the manifold as a common part. This carburetor retains the old Kingston feature of ball valve.

Model L Heats All Air

The model L, which is the later design, has a concentric cork float around a jet placed at an angle from the vertical. The air, all of which is heated, is taken in through a single opening and swept downward through a curved passage whose shape gives it the proper velocity and direction to sweep across the end of the flat nozzle, thus picking up the

fuel. The suction is regulated automatically by means of a flapper valve which assists in acceleration and whose action is explained below.

There is always a pool of gasoline at the base of the tube when the motor is not running. This is for the purpose of positive starting. When the motor starts this pool is quickly lowered to a lower portion of the tube, depending on the adjustment of the needle valve and continues to feed from this point until the motor is stopped.

When the motor is running slowly the air valve rests lightly on its seat, allowing no air to pass, consequently all air must pass through the low-speed tube, as the lower end of this tube is close to the spray nozzle and all the air at low speed has to pass this point, the atomized gasoline drawn from the nozzle becomes thoroughly mixed with the air in its upward course.

As the throttle is opened the air valve rises, permitting a small volume of mixture to pass by, due to the suction of the engine. At this point a change in operation occurs. The low-speed tube still continues to deliver a perfect mixture, but is being assisted by the air valve opening. The air must pass across the spray nozzle between it and the low-speed tube. As the motor speed is increased up to its maximum the air valve continues to rise higher, permitting more and more air, which passes across the spray nozzle with no increase in velocity and picking up the gasoline from it.

Industrial Miscellany

Factory

American Auto Trimming Co., Cleveland, has leased quarters in which it will establish a plant.

W. A. McManus and F. A. Hagner, of Newark, N. J., have formed the General Safety Signal Co., with a capital of \$500,000 to manufacture safety signal devices for automobiles.

Crown Tire & Rubber Co., Omaha, Neb., is about to start the building of the first unit of a tire and rubber plant, for which 5 acres has been purchased in a manufacturing suburb of Omaha. The company will produce 300 tires and 250 tubes daily. It is planned to have the building up and machinery installed about Aug. 1 next. An output of fifty tires a day, both cord and fabric types, will be undertaken in a temporary location.

K. D. Carburter Co., Cleveland, will erect a new three-story concrete factory, 100 by 250 ft.

Sayres & Scoville Co., Cincinnati, carriage builder, will enlarge its factory to devote its manufacture to automobiles and special motor trucks.

H. P. Miller, Fort Worth, Tex., plans to build a plant at Dallas for the manufacture of an automobile appliance.

Saunders Motor Power Co., East St. Louis, Ill., is preparing to equip a plant for the manufacture of a rotary motor operated with steam, gas or gasoline. J. H. Keys is president.

Midcontinent Tire Mfg. Co., Wichita, Kan., will build the first unit of its plant. This will cost \$65,000 and will be two stories, 60 by 280 ft.

Pierce-Arrow Motor Car Corp., Buffalo, N. Y., will erect a sand blast and pickling building of steel construction.

Anger Engineering Co., Milwaukee, will build a plant at Twenty-sixth and State Streets.

Locomobile Co. of America will erect a one-story, 100 by 160-ft. addition.

B. P. Motor Car Co., Peoria, Ill., has been incorporated to manufacture motors for automobiles and other machines. Temporary quarters have been secured at 418 Main Street. A new building is planned on Hamilton Street, to be erected as soon as the old opera house structure is demolished. The officers of the company are as follows: President, E. T. Beatty; vice-president, R. U. Pfeiffer; secretary-treasurer, J. S. Pfeiffer.

DeLion Tire & Rubber Co., Trenton, N. J., is about to erect a three-story, 65 by 175-ft. addition.

Alpha Rubber Mfg. Co. will locate its plant in Genoa, Ill. The company is capitalized at \$1,000,000 and will occupy the piano factory in the west end of the city. It will manufacture tires. Seventy-five men will be employed at the beginning. J. A. Berger is president and general manager.

Atwater Kent Mfg. Co., Philadelphia, manufacturer of ignition systems, is erecting a one-story factory building at 4937 Stenton Avenue.

Autocar Co., Ardmore, Pa., recently marked the close of one of the most successful years in its history by entertaining its salesmen and branch managers at the factory. Among those in attendance were W. T. Savoye, New York; J. E. Higgins, Providence; R. P. Page, Boston; M. S. Bulkley, Los Angeles; K. B. Harwood, Chicago; A. H. Bishop, Baltimore, and A. E. Fisher, Newark.

J. B. D. Resilient Wheel Mfg. Co., Milwaukee, which was organized about 3 years ago to manufacture and market a solid-tire wheel for passenger cars and trucks, has changed its corporate style to the Motor Parts Machine Co. The plant at 675 Smith Street has been extended and enlarged to include the production of a varied line of car, truck and tractor parts for the trade.

The Automobile Calendar

ASSOCIATIONS

- Jan. 6-13—New York, Mid-Winter Meeting of Society of Automobile Engineers, Engineering Society Bldg.
- Jan. 9—New York City, National Automobile Chamber of Commerce, Annual Banquet at Waldorf-Astoria.
- Jan. 9-11—New York City, Society of Automobile Engineers' Mid-Winter meeting, Thursday, Jan. 11, S. A. E. day, Annual Banquet, Hotel Biltmore, Special performance Ziegfeld's Midnight Follies.
- Jan. 10—New York City, Motor and Accessory Manufacturers' Banquet, Waldorf-Astoria.
- Feb. 1-2—Chicago, Ill., Annual Convention American Assn. of Garage Owners, Auditorium Hotel.

CONTESTS 1917

- April—Los Angeles to Salt Lake City Road Race.
- May 19—New York Metropolitan Race on Sheepshead Bay Speedway.
- May 30—Indianapolis Speedway Race, Championship.
- June 9—Chicago, Ill., Speedway Race, Championship.
- June 23—Cincinnati, Ohio, Speedway Race.
- July 4—Omaha, Neb., Speedway Race, Championship.
- July 14—Des Moines, Iowa, Speedway Race, Championship.
- July 4—Tacoma, Wash., Speedway Race, Championship.
- Aug. 4—Kansas City Speedway Race.
- Sept. 3—Cincinnati, Ohio, Speedway Race, Championship.
- Sept. 15—Providence, R. I., Speedway Race, Championship.

- Sept. 29—New York, Speedway Race, Championship.
- Oct. 6—Kansas City Speedway Race.
- Oct. 13—Chicago Speedway Race.
- Oct. 27—New York Speedway Race.

SHOWS

- Dec. 9-16—Akron, Ohio, Show for Passenger Cars Only, Market Street Gardens, Akron Automobile Dealers' Show Assn.
- Dec. 18-20—San Francisco, Cal., Automobile Salon De Luxe, Palace Hotel, I. R. Gates, Mgr.
- Dec. 26-27—Olean, N. Y., Show, Armory Hall.
- Dec. 30-Jan. 6—Cleveland Automobile Accessory Show, Dreamland Auditorium.
- Dec. 30-Jan. 6—Cleveland, Ohio, Sixteenth Annual Show, Wigmore Coliseum, Cleveland Automobile Club.
- Jan.—First Pan-American Aeronautic Exposition, New York City; Aero Club of America, American Society of Aeronautic Engineers, Pan-American Aeronautic Federations.
- Jan. 2-10—New York, Automobile Salon, Hotel Astor, J. R. Eustis, Mgr.
- Jan. 6-11—Milwaukee Auditorium, Milwaukee Automobile Dealers.
- Jan. 6-13—New York City, Show, Grand Central Palace, National Automobile Chamber of Commerce.
- Jan. 12-20—Philadelphia, Show, Philadelphia Automobile Trade Assn.
- Jan. 9-10—Fort Dodge, Ia., State Convention, Iowa Retail Automobile Dealers' Assn.
- Jan. 20-27—Detroit, Mich., 16th Annual Show, Detroit Automobile Dealers' Assn.

- Jan. 22-27—Rochester, N. Y., Show, Exposition Park, Rochester Auto Trades Assn.
- Jan. 22-27—Manchester, N. H., Academy.
- Jan. 22-27—Buffalo, N. Y., Show, Broadway Auditorium, Buffalo Automobile Dealers' Assn.
- Jan. 23-27—Baltimore, Md., Show, Fifth Regiment Armory.
- Jan. 25-27—Asheville, N. C., Show, Asheville Automobile Trade Assn.
- Jan. 27-Feb. 3—Columbus, Ohio, Show, Memorial Hall, Columbus Dealers' Assn.
- Jan. 27-Feb. 3, 1917—Chicago, Ill., Show, Coliseum, National Automobile Chamber of Commerce.
- Jan. 27-Feb. 5—York, Pa., Show, York Automobile Dealers' Assn.
- Jan. 20-27—Montreal, Que., Automobile Trade Assn.
- Jan. 28-Feb. 3—Wilmington, Del., Show, Hotel duPont.
- Feb.—Newark, N. J., Show, First Regiment Armory.
- Feb. 3-10—Minneapolis, Minn., Show, Minneapolis Automobile Trade Assn.
- Feb. 5-9—Boston, 8th National Good Roads Show, Mechanics' Bldg.
- Feb. 5-10—Bangor, Me., Bangor Automobile Assn., Auditorium.
- Feb. 10-18—San Francisco, Cal., Pacific Automobile Show, G. A. Wahlgreen, Mgr.
- Feb. 12-17—Louisville, Ky., Show, First Regiment Armory, Louisville Automobile Dealers' Assn.
- Feb. 12-19—Indianapolis, Ind., Show, Steinhart Bldg., Indianapolis Automobile Trade Assn.

- Feb. 19-24—Grand Rapids, Mich., Show, Automobile Business Assn. of Grand Rapids.
- Feb. 14-17—Peoria, Ill., Coliseum, Automobile and Accessory Dealers' Assn.
- Feb. 18-25—St. Louis, Mo., Show, Automobile Manufacturers' and Dealers' Assn.
- Feb. 19—Pittsfield, Mass., Show, Armory, J. J. Callahan, Mgr.
- Feb. 19-24—Duluth, Minn., Show, Duluth Auto Dealers' Assn., Armory.
- Feb. 19-24—Bridgeport, Conn., Show, Armory, Coast Artillery Corps.
- Feb. 19-24—St. Louis, Overland Bldg., St. Louis Auto Dealers' Assn.
- Feb. 19-24—Syracuse, N. Y., Show, State Armory, Syracuse Dealers' Assn.
- Feb. 24-March 3—Brooklyn, Show, 23rd Regiment Armory.
- Feb. 26-March 3—Omaha, Neb., Show, Auditorium, Omaha Automobile Show Assn.
- March 1, 2, 3—Urbana, Ill., Show, Automobile Trade Assn. of Champaign Co. Armory of the University of Ill.
- March 3-10—Boston, Mass., Show, Mechanics' Bldg., Boston Automobile Dealers' Assn.
- March 6-10—Ft. Dodge, Iowa, Northern Iowa Show, New Terminal Warehouse, G. W. Tremain, Secretary.
- March 14-17—Davenport, Iowa, Show, Coliseum Bldg., Tri-City Automobile Trade.
- March 18-23—Cedar Rapids, Ia., Cedar Rapids Automobile Trades Assn.
- April—Calumet, Mich., Show, Coliseum, Frank Ketchell, Mgr.

Elgin Motor Car Co., Chicago, has completed a 3/4-mile test track, over which every car is tested before shipment. The Elgin factory is also located near a steep hill, which provides opportunity to test the hill-climbing qualities of every car.

Sheller Wood Rim Mfg. Co., Portland, Ind., manufacturing single-piece wooden rim automobile steering wheels, is making plans for a factory.

Davis Mfg. Co., Milwaukee, a manufacturer of gasoline engines for trucks, tractors, railway coaches and similar purposes, is reported to be preparing to make important works extensions, made necessary by the extraordinary demand for its products. The new building, it is said, will consist of a shop, 124 by 225 ft., and a pattern shop, 30 by 90 ft.

Elwell-Parker Electric Co., Cleveland, maker of storage battery industrial trucks and tractors, will enlarge its plant by the erection of a four-story building, 60 by 120 ft. This will be a duplicate of an extension built some time ago. A third unit of the same size is contemplated early next year.

Personals

J. F. Douse has been appointed sales manager and advertising manager of the George W. Miller Co., Seattle. Previous to this change Mr. Douse was manager of the Seattle branch of the Fisk Rubber Co. Mr. W. P. Williams will remain as general manager of the George W. Miller Co.

Herbert Dovey has been appointed manager of the Sturgis & Storie Co. of Walla Walla, Wash., agent in Walla Walla for the Buick, G. M. C. trucks and Bull tractors.

H. C. Plow has purchased the Automobile Owners' Accessory Co., Ltd., of Montreal, Can. Mr. Plow, who is known to the industry as "Hy" Plow, was at one time treasurer of the Hartford Rubber Co.

J. E. Morehouse is manager of the Detroit branch of the Scripps-Booth Corp. The branch was recently opened.

George Grow, Boston, used-car dealer, has purchased from the Willys-Overland Co. the four-story building on West Newton Street that had been used by the Connell & McKone Co., eastern Massachusetts Overland dealer, as a service station for the past 5 years.

R. C. Wilson has been appointed general manager of the Columbus Cadillac Co., Columbus, Ohio, succeeding E. C. Moliter. Mr. Wilson has been a director and sales manager of the Standard Motor Car Co. there.

V. A. Seiders has been appointed Southern sales agent for the Bell Motor Car Company, York, Pa., and will cover the States of Virginia, North Carolina, South Carolina, Georgia, Alabama, Florida and Tennessee.

A. B. MacGowan, formerly in the sales promotion department of the Chase Motor Truck Co., Syracuse, N. Y., is now city sales manager for that company at its Philadelphia branch.

D. F. Shanahan of Covington, Va., has joined the sales force of the Chase Company as special traveling representative.

F. L. Terry, who for the past 4 years has had service on S. G. V. and Fiat cars, has taken in a partner, R. E. Hardy, and opened an accessory store at 1441 Bush Street, San Francisco. The firm is known

as Terry & Hardy, accessory dealers and Firestone distributors.

H. E. McEldowney of Seattle, Wash., has been appointed agent for the Hendrick's 1-ton truck attachment in Tacoma, Wash., and surrounding territory.

S. W. Dorman has become purchasing agent of the automobile accessory department of the Biddle Purchasing Co., New York.

Jack De Mont, Atlanta, Ga., for more than a year manager of the Willard Storage Battery Co. branch, has been transferred to New York and Al. C. Hyser of Cleveland, Ohio, succeeds him as Atlanta manager.

A. H. Abel, Birmingham, Ala., has become sole owner of the Abel-McCay Wagon Co. and has changed the name to A. H. Abel Wagon Co. In addition to automobile repairing the company will sell Redden trucks.

N. B. Ford, who for 10 years traveled for the Corbin Screw Corp. from its Chicago office, having his headquarters in Kansas City, and who left some 2 years ago to become connected with the Ford Chain Block & Mfg. Co., Philadelphia, has re-entered the employ of the Corbin Screw Corp. as salesman, with headquarters in New Britain and covering the territory formerly traveled by A. H. Harrop.

C. B. Lindeman, formerly Western advertising representative of the Firestone Tire & Rubber Co., has been appointed head of the creative division of the company with offices in Akron.

W. J. Denning has recently been appointed manager of the cataloging and advertising departments of the Auto Parts Co., Chicago.

J. L. Hamilton, secretary of the Bay State A. A., has formed a partnership with Stanley Hall, one of the directors, and it is named the H. & H. Motor Specialties Co., to handle accessories.

W. E. Hennigan, for many years with the Winton New England branch, and Herbert Ramsey, a former Hupmobile man, have joined the sales force of the Harry Fosdick Co., handling the Pathfinder at Boston, Mass.

J. J. Devaux has resigned as Oregon distributor in Seattle for the Chevrolet car in order to take the agency for the Regal car in Lower California.

F. H. Downes has been appointed head of the Smith Form-A-Truck department of Ballou & Wright of Portland, Ore.

W. E. Duersten, formerly production and efficiency expert of the Western Electric Co., and later connected with the Hudson factory, has been named factory superintendent for the Macon Motor Co., Macon, Mo.

O. R. Randall, for 7 years sales manager of the Middle Western and Southwestern territory of the J. I. Case T. M. Co., Racine, Wis., has resigned, effective Jan. 1, to engage in business at Atlanta, Ga., as State distributor for Georgia of a line of pleasure cars, trucks and tractors, the names of which are not yet divulged. Mr. Randall joined the Case Company in 1901, first as agent in Atlanta. In 1909 he was called to the home offices to accept one of the most important posts in the sales organization. His son, E. A. Randall, now associated with the Western Advertising agency of Racine, will become associated in the new venture at Atlanta.

E. A. Jacob succeeds J. W. Wildman as manager of the Des Moines, Iowa, branch

for the Portage Rubber Co. Mr. Wildman leaves to take charge of the Chicago Portage branch.

J. B. Brugler has been appointed manager of the new Indianapolis branch of the Racine Horse-Shoe Tire Co., Racine, Wis., which has just been opened at 249 North Pennsylvania Street.

H. P. Nelson has become treasurer and sales manager of Robert Lurie & Co., New York, handling the Metz.

Dealers

Kelly-Springfield Tire Co. has opened a factory branch at 1225 Harmon Place, Minneapolis, succeeding the Boger-Stiess Rubber Co., its agent for 2 years. G. M. Martin, manager for the Firestone Tire & Rubber Co. branch at 1635 Hennepin Avenue, is appointed manager. The territory is Minnesota, the Dakotas, western Wisconsin and western Canada. A. C. Searles is new manager for the Firestone company.

F. B. Stearns Co. of New York announces that the wholesale end of its business is now in charge of the factory branch. The wholesale business was formerly handled by Charles E. Riess & Co., metropolitan distributor of the Hupmobile.

Metz cars will be distributed in Chicago by James Haddie at 729 Lyman Avenue, Oak Park.

Troy motor truck trailers will be handled by the Barden Electric & Machinery Co., Houston, Tex., and by the O'Rourke-Muller Motor Co., New Orleans.

Chalmers Motor Co., Detroit, has issued to all its dealers plans for an effective service inspection. During 1917 each Chalmers dealer or distributor will maintain a Standard Chalmers service car which will be distinguished by its color scheme of red and black. This car will have a red body, black hood and running gear.

Willard Storage Battery Co., Cleveland, has added during the past month about sixty new service stations, making the total up to 831.

Benton County Hardware Co., Rogers, Ark., a wholesale hardware concern, which operates a string of retail stores and travels a number of salesmen, has added automobile accessories to its jobbing line. The company is contracting accessories on a jobbing basis and compiling an extensive catalog.

Packard Motor Car Co., Philadelphia, will build an eight-story steel and concrete service plant, 70 by 185 ft., at Broad and Wood Streets.

Padgett Bros. Co., Dallas, Tex., has closed contracts for the Texas agency for the Kelly-Springfield and Commerce trucks and for the Babcock and Parry commercial bodies and for the Racine tires.

Cole Automobile Co., Peoria, Ill., has removed from 1812 Main Street to a new location at 103 Ellis Street, and will operate a sales agency, garage and service station. Eugene Hayden is now distributor for the Cole in Peoria and vicinity.

Denver Auto Goods Co., Denver, has taken the Colorado distributing agency for Pennsylvania tires.

R. E. Williams Motor Car Co., Denver, a new concern, has secured the Abbott-Detroit distributing agency for Colorado and southern Wyoming.